ALCYONARIA

STOLONIFERA. ALCYONACEA. TELESTACEA AND GORGONACEA)

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WITH ELEVEN TEXT-FIGURES AND FIVE PLATES

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1. INTRODUCTION.

THIS paper gives a systematic report on the Stolonifera, Alcyonacea and Telestacea collected on the Great Barrier Reef Expedition, apart from the Alcyonacean family Xeniidae which has already been reported on by Prof. S. J. Hickson. Three Xeniids, omitted from the material given to Prof. Hickson to describe, are, however, added to this report. The Gorgonacea were also described by Prof. Hickson, but I have to add to this paper two further Gorgonaceans. One of these, *Solenopodium stechei*, as I shall describe later, has had rather a pathetic history, as it was cast out from the Gorgonacea by Prof Hickson, and now is similarly rejected from the Alcyonacea by myself. The two points of view as to the systematic position of this interesting genus are given here by us both.

The collection is a fine one and the specimens are, in most cases, beautifully preserved. Altogether 51 species are described, of which 6 are new. These species are included in 22 genera. Many have been previously reported from the seas of the East Indies and Philippines, the Alcyonarians of which have been described to a considerable extent in recent years, several from Torres Straits and the Western coasts of Australia, and several with a wide distribution, including the Indian Ocean and the Red Sea, with one, the widespread *Tubipora musica*, from the West Indies.

My thanks are due to Dr. Calman for his kindness in giving me the opportunity of working on this interesting collection, to Capt. Totton for all the facilities for examining types, etc., while I have been working in the British Museum (Natural History), to Prof. Hickson and Prof. Cannon for the loan of certain type-specimens, to Prof. Stephenson for his helpful field-notes, and to Dr. Manton for her very fine field photographs.

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Order GORGONACEA.

Sub-order SCLERAXONIA.

Family Briareidae.

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Iciligorgia orientalis, Ridley.

3. DESCRIPTION OF SPECIES.

Order STOLONIFERA.

This order, established by Prof. S. J. Hickson in 1883, has had a chequered history, with a great amount of confusion amongst the genera originally assigned to it by Prof. Hickson. Latterly several of the genera have been moved by various workers in the group to other orders, and some genera have been found to be synonymous, so that the order

has considerably fewer genera in our present state of knowledge. There is still, however, considerable doubt as to the natural position of certain genera, and as to the validity of others.

There are three genera represented in the Barrier Reef collection which I consider should be placed in the order Stolonifera namely, *Sarcodictyon*, *Clavularia* and *Pachyclavularia*. *Sarcodictyon*, according to Kükenthal, is identical with *Evagora*, a genus with which, he states, *Rhizoxenia* is synonymous. I agree with Prof. Hickson (' Proc. Zool. Soc.', Pt. I, 1930, p. 210) that the evidence as to *Sarcodictyon* and *Evagora* is far from conclusive, and in the meantime I retain the genera as distinct. If *Sarcodictyon* is to be suppressed, Molander (' Swed. Antarctic Exp.' II, No. 2, 1929, p. 40) is too general in his statement as the form of spicules, " kleine Gürtelstäbe, gewöhnlichte Sechser oder unregelmässige Kalkkörper, und erinnern an die Spicula bei *Erythropodium caribaeorum* ". The typical spicule of *Sarcodictyon catenata*, Forbes, is a rather scale-like roundish spicule with a frayed edge, and the spicules are very densely packed together. The spicules of *Evagora rosea*, on the other hand, do certainly come near to *Erythropodium caribaeorum*.

Kükenthal (1916), followed by Molander (1929), assigned the genera *Evagora* (and *Sarcodictyon*), *Erythropodium* and *Solenopodium* to the gorgonacean family Briareidae, and later Molander (1929) transferred to it the genus *Pachyclavularia*. *Sympodium*, one of the most discussed genera, is now generally and rightly, I think, recognized as a Xeniid, and *Parerythropodium* as an Alcyoniid.

I agree with Prof. Hickson that *Sarcodictyon*, *Evagora*, *Erythropodium* and *Pachyclavularia* should be retained as Stolonifera and not considered as Gorgonacea. To get so far away in those creeping forms from the definition of the Gorgonacea as having well-defined axes seems to me mistaken, unhelpful to systematists and not a very natural system of classification.

Prof. Hickson and I have a friendly disagreement, however, over the position of the genus *Solenopodium*, of which there is one species in this collection. As Prof. Hickson considers that it, too, is a Stoloniferan genus, he did not include it in his report on the Gorgonacea of the Great Barrier Reef Expedition (1932), but left it to be described with the Alcyonacea. I now in turn reject it, and describe it here as a Gorgonacean. It seems to me impossible to separate *Briareum* and *Solenopodium* ; the spiculation is almost indistinguishable, and *Solenopodium* approaches towards the *Briareum* type of growth. It does not always show a creeping form of growth, but hollow stems grow upwards which are sometimes solid at the tops, forming as it were the beginning of a solid axis. I feel that this genus has definitely crossed the border between the Stolonifera and the Gorgonacea, to the lowest stage of the Scleraxonia. I here quote a note from Prof. Hickson giving his views on the subject :

" The genus *Solenopodium* is of special interest because it seems to be a perfect connecting link between the two orders of Alcyonaria—the Stolonifera and the Gorgonacea.

" The determination of its correct position in one or other of these two Orders depends on the conception of the principal character which should be used to distinguish them.

" In former times the character that was universally used to distinguish the Gorgonacea from other Alcyonaria was the presence of a horny or calcareous axial rod.

" If this character is adopted for the diagnosis of the Order then *Solenopodium* is

not a member of the Gorgonacea because it has no axis. the stems which spring irregularly from the large creeping stolon being hollow.

" In more recent times, however, Kükenthal and his followers have substituted for the presence of an axis the presence of ' horn ' in the skeleton as the character of the group and, although there is no evidence that its basal membrane is really ' keratin ', *Solenopodium* is placed among the Gorgonacea.

" For many reasons which I have fully discussed in my paper in the ' Proc. Zool. Soc.', 1930, Pt. I, pp. 234–241, the presence of a horn-like skeletal substance is not a good diagnostic character. It occurs in some genera, *e. g.* the Telestidae, which do not belong to Kükenthal's group Gorgonaria, and it does not occur in others (*e. g.* the Coralliidae) which do belong to it.

" It is true that *Solenopodium* does show some resemblances to the Gorgonacean genus *Briareum* and it may indicate a stage in the evolution of the Gorgonacea from the Stolonifera, but as there are no essential differences in other characters, such as in the canal system or the spicules between this genus and other genera of the Stolonifera, I am of opinion that it should be referred to that Order on the ground that it has no horny or calcareous axis."

The genus *Hicksonia*, I am now convinced, must lapse as a synonym of *Clavularia*. As to the genus *Pachyclavularia* I agree with Prof. Hickson and differ from Molander in thinking it a Clavulariid. There is no doubt that it is a form leading towards *Solenopodium* and *Briareum*, but on the other hand, its affinities with *Clavularia* seem to me even greater. I consider the Stolonifera as an order comprising various rather primitive forms which lead to several higher groups—*Pachyclavularia* leading to the Scleraxonians, *Clavularia* leading to the Telestacea and *Anthelia* to the Xeniidae. Molander (1929) includes *Clavularia* with the Telestids, but that I think is stretching the case too far. Roxas (1933) also has not followed him in this, but retains both *Clavularia* and *Anthelia* in the Stolonifera. Prof. Hickson in his report on the Xeniidae of the Barrier Reef Expedition (1931) emphasizes the necessity of suppressing the genus *Anthelia* as a synonym of *Sympodium*, and considers that the species described as *Anthelia* at the moment are Xeniids. I cannot share the opinion that *Anthelia* is the same genus as *Sympodium* ; they seem to me quite distinct, both in spiculation and in form of growth. The spicules of *Sympodium* are minute discs typical of *Xenia* species ; species of *Anthelia* have minute narrow rods as their spiculation. I have examined many species of *Anthelia* and colonies of *Sympodium coeruleum* and no *Anthelia* shows any sign of contraction, while the polyps in *Sympodium* contract till they are buried in the rather thick basal membrane. As to *Anthelia* itself being a Xeniid, it certainly shows definite affinities with this family. If the presence of only the dorsal mesenteric filaments is confirmed from species other than the one quoted by Prof. Hickson it will be definitely established as a Xeniid.

Family Cornulariidae.

Sub-family Clavulariinae.

Genus *Clavularia*, Quoy and Gaimard.

Cornulariids with polyps united by a basal stolon or basal membrane containing a network of canals. Polyps may also be united by transverse connecting stolons at a varying height up the polyp wall and a new polyp may grow from such a connecting stolon.

Polyps divided into a basal non-retractile calix and a distal anthocodia, which is retractile into the upper half of the calix. The spicules of the calix are long-warted spindles arranged in vertical rows ; the spicules of the anthocodia are always smaller and smoother, sometimes minute and of quite different form. There is definitely a horny secretion in the calix of some species.

Clavularia inflata, Schenck, var. *luzoniana*, May.

Roxas, Philippine Alcyon, Philipp. J. Sci. L, No. 1, 1933, p. 58.

Three colonies of this species all show the rare feature shared by this species and *C. viridis*, namely, the stolons connecting one polyp with the middle of another. We can add nothing further to our previous descriptions—the Great Barrier Reef specimens agree in detail with the type-specimens. The three colonies show polyps in all stages of development and in all stages of expansion ; in all the pinnules of the tentacles are a glistening white owing to the dusting of innumerable minute spicules (rodlets and a few discs) ; the calyx and anthocodia in one colony (Detailed Survey II) are grey-brown with the chevroned spindles of the anthocodia showing up against the brown background ; in another (General Survey, A 71) they are creamy-white, and in another from Maer Island a greenish-grey colour. Prof. Stephenson informs me that the species was very plentiful in some parts of Low Isles, both in the Anchorage and on the seaward slopes ; it sometimes formed extensive continuous carpets. The tentacles during life were purplish or pinkish brown.

Localities : Maer Island.
Low Isles, General Survey A. 1.
Low Isles, Detailed Survey II.
Previously recorded from Luzon (Philippines), Ternate, Dutch East Indies.

Genus *Sarcodictyon*, Forbes.

Encrusting Cornulariid colonies consisting of narrow stolons, which may form a mesh, with small polyps arising at varying intervals. The polyps are divided into a cone-like calix with hard walls, up to about 2 mm. high, and a distal anthocodia which is soft and is retractile into the calix. The spicules of stolon and calix are usually of flat irregular shape, closely packed together, sometimes with fusion, so that both stolon and calix are hard and inflexible. A horny membrane at the base of the stolon may be present.

Sarcodictyon herdmani (Hickson).

Hickson, Proc. Camb. Phil. Soc., 1921, XX, pt. III, p. 366 ; Proc. Zool. Soc., 1930, p. 210, 1 fig.

A slender pink stolon 2·8 mm. long with small conical calices arising at intervals of 2–3 mm. has grown along a slender Antipatharian twig, which also bears a young colony of *Nephthya aurantiaca*. Prof. Hickson has very kindly sent me for examination his type-specimen of *Sarcodictyon herdmani*, and after a careful comparison of these two specimens I consider that, though the Barrier Reef specimen differs slightly from the type, it comes so near to it that it should be considered as at least a variety of this species.

The calices are in most cases low swellings on the stolon, up to 1·7 mm. broad and with a height of 1 mm. or less. One calix, however, has a height of 1·5 mm. The polyps are white, and in one expanded polyp, though the preservation is not good enough to allow of an exact determination of the arrangement of spicules, there can be seen an armature towards the base of the anthocodia, of slender white spindles, arranged horizontally nearest the calix and longitudinally further up the anthocodia.

Our specimen differs from the type in that, though there is a certain amount of fusion, it is not nearly so extensive as in the Adelaide specimen. Also the irregular type of branched spicule is preponderant in the Barrier Reef form, and the warted spindle type though present, is not so numerous. The same types of spicule are present in both specimens, however, and there does not seem to be sufficient reason to separate the two into different species. There is no question, as Prof. Hickson has stated already, that this species is quite distinct from *S. catenata*.

Locality : Station XII. Dredge.

Previously recorded from South Australia.

Genus *Pachyclavularia*, Roule.

Cornulariids with polyps united basally by stolons or a membrane, which may divide in distinct horizontal lamellae. The polyps consist of a hard-walled tubular calix and a distal soft retractile anthocodia. The typical spicule is the warted spindle.

Pachyclavularia erecta, Roule.

Roule, Rev. Suisse Zool. XVI, 1908, p. 165, 3 figs. ; Molander, Swedish Antarctic Exped. II, No. 2, 1929, p. 24 ; Thomson and Dean, Alcyonacea of the Siboga Exped., Monogr. XIII*d*, 1931, p. 19, 8 figs.

A young colony growing on a stone shows the reddish-violet colour, the folded, thick basal membrane, and the stiff-walled, longitudinally-grooved calices, with an average height of 6 mm., all characteristic of the species. In the majority of the polyps the anthocodial portion is fully retracted, but in two or three polyps it is partially expanded. In one polyp an interesting stage of retraction is shown where the anthocodia is expanded beyond the calycine portion of the polyp and the mouth is clearly visible, but the tentacles, which are individually retractile (see Thomson and Dean, 1931), are still invaginated. A field-note included with the specimen, " green polyped ", agrees with Roule's coloured plate of the type, showing brilliant green anthocodia and tentacles, above the red-violet calix. In spirit the green colour of the anthocodia is lost and it is cream-grey in colour. The anthocodia and tentacles under examination proved to be literally packed with a dense mass of zoochlorellae and no spicules were observed.

The spiculation shows large spindles covered with zones of warts and branched, irregular forms. The spicules in the basal membrane are bound together in a horny matrix.

The systematic position of the genus *Pachyclavularia* has already been discussed (see p. 23).

Locality : Wishart's Reef (A. 3).

Previously recorded from Amboina, Dutch East Indies.

Family Tubiporidae.

Genus *Tubipora*, Linnaeus.

Cornulariids distinctive in having very elongated tubular polyps with complete fusion of spicules to form a solid hard mass. Flat horizontal platforms or laminae connect the close-set polyps, and from these platforms new polyps may arise.

Tubipora musica, L.

Hickson and Hiles, Willey's Zool. Results IV, 1900, p. 493.

Three dried colonies, two of which are described as from Low Isles, and one preserved in spirit, from the Outer Barrier, Ribbon Reef. All are a deep crimson-red colour, with the partially expanded polyps showing white in the spirit specimen. Two of the dried colonies and the spirit specimen show a close-set type of growth with adjacent polyps nearly touching each other, the whole colony forming a dense rounded mass. The third dried specimen (overgrown in parts by a Polyzoan) is much more open and less compact, with an average distance between adjacent polyps of 4 mm. This is a good example of the extreme variation possible in the form of colonies of *Tubipora*, in which genus, following Prof. Hickson's view after examination by him of very numerous specimens in Celebes and from elsewhere, we find only one species, *T. musica*.

Localities : Low Isles, outside Anchorage, 6 fathoms.

Outer Barrier, Ribbon Reef, Middle Zones.

Previously recorded from Red Sea, Indian Ocean, West Indies, tropical Pacific Ocean, Dutch East Indies.

Order ALCYONACEA.

Family Xeniidae.

Genus *Cespitularia*, Milne-Edwards.

Xeniids with dendritic branching, and no sharply-defined margin to the capitulum, the polyps arising not only on the summit of the branches, but in gradually diminishing numbers down their sides. Colonies typically soft, and with weak or no spiculation. The spicules, if present, are small discs, irregular ovals, or biscuit-shaped.

Cespitularia erecta, n. sp. (Plate IV, fig. 7.)

Two small colonies from Station XXIII cannot be referred to any of the described species. They differ from *C. taeniata*, *C. coerulea*, *C. wisharti*, *C. hypotentaculata* and *C. quadriserta* (the last two recently described by Roxas, 1933) in the presence of spicules ; from *C. simplex*, *C. mollis* and *C. mantoni* in the size and shape of the spicules and in the mode of growth ; from *C. multipinnata* in the arrangement of pinnules and mode of growth ; and from *C. subviridis* in the size of polyps and number of pinnules.

The largest of the two colonies has a height of 3·5 cm. and a maximum spread of 1·8 cm. A short stem, 9 mm. in maximum diameter, gives rise to 4 short branches and a terminal branch. The longest branch has a length of 1·4 cm. and a diameter of 5 mm. and 3 mm. The stem is only slightly flattened, as are the other branches, which give rise

to 2 or 3 very short twigs. The branches are covered with the short stout polyps, which reach a length of 2 mm. and with tentacles up to 2·6 mm. long. The pinnules are arranged in a single row of 18–20 on each side of the tentacle; they are longest towards the middle of the tentacle, where they are up to 0·4 mm. in length with a basal breadth of 0·1 mm. They are finger-like and pointed when expanded. A few rudimentary buds of polyps are to be seen on the stem.

The whole tissue of the colony is filled with a dense mass of small spicules. These are either roughly circular, or oval, or with definite corners, so that little polygons or squares are seen. They are smooth and refractive without the surface sculpturing seen in *C. simplex*, and they are neither nearly as large nor with as smoothly circular outlines as in *C. mantoni*, and are much more numerous than in the latter species. They attain a diameter of 0·045 mm.

The colony is quite firm in texture and stands erect. It is cream white in colour.

The smaller, almost circular colony with a height of 2·4 cm. and a maximum diameter of 2·2 cm. has a flat base, almost membranous, from which arise 5 close-set main branches which give off 1 to 4 short branches. It agrees exactly with the first specimen in all other characters.

Locality: Station XXIII. Dredge.

Cespitularia simplex, Thomson and Dean.

Thomson and Dean, Alcyonacea of the Siboga Exped., Monogr. XIII*d*, 1931, p. 33, 1 fig.

A small colony from Station X agrees well both in form of growth and in spiculation with the type of the species. It shows a membranous base (which creeps over two pieces of rock and connects the two mid-way), from which arise the very simple stems, which are either finger-like and unbranched or else very simply branched. In this case 7 of the stems are unbranched and one gives off one small twig 4 mm. long. The longest unbranched stem has a height of about 1·5 cm. and a breadth of 4 mm.

Another distinctive feature is the spiculation, which consists of extremely numerous, very minute discs, seen to be finely sculptured under a high magnification and about 0·01 mm. in diameter.

The colour is creamy, streaked with extraneous staining of red from some debris.

Locality: Station X. Dredge.

Previously recorded from Kawassang, Dutch East Indies.

Cespitularia wisharti, Hickson.

Hickson, The Xeniidae, Sci. Rep. Great Barrier Reef Exped. IV, No. 5, 1931, p. 165, 1 fig.

A small yellowish colony, not very well preserved, from Station XXIII shows 6 unbranched or slightly branched stems arising from a ribbon-like base. The polyps are, for the most part, 1–2 mm. long, but 3 to 4 extended ones are 3 mm. long. The tentacles are about 1·8 mm. long, and have a single row of about 15 pinnules on each side of the mid-line. (In the type-specimen in a fully expanded tentacle I found the pinnules stretched into a single row of 18 on each side of the tentacle.) There are no spicules.

A very contracted colony from Low Isles is most remarkable in the development of numerous sucker-like outgrowths with oval attaching discs. Some of the branches terminate in a fringe of these or they may grow out from the side of a branch. I have

seen the development of a sucker in *C. simplex* (see " Siboga " Exped., 1931, p. 34), but this great development of these attaching outgrowths is extremely unusual. The longest of these outgrowths is strap-like, with a length of 1·4 cm. and a breadth of 1·5 mm. and forming at the extreme tip into two small oval suckers. The polyp tentacles are in the majority of the polyps contracted to a minute length, 0·1 mm. or less, so that with the naked eye the polyp appears like a small tube without tentacles. The pinnules on these minute tentacles are very difficult to detect. In some of the polyps the tentacles are about 1 mm. long with 8–12 pinnules. The length of the polyps themselves is also most variable, but an average one is about 2 mm. long.

The form of growth is also curious, as the base grows in a complete circle round a space in the middle. Both the base and the stems which arise from it are flattened, though some of the short upper branches into which the stems divide are quite rounded. The branching is very variable. Some stems arise unbranched from the base, while others may give off up to five short branches, 5 mm. long, which may again fork 5 mm. from the tip. There are no spicules.

I have compared this specimen carefully with the type of *C. wisharti*, and have no doubt that it is a very contracted specimen of the species, with sucker development owing no doubt to special environmental conditions. The colour is brownish grey.

Another difficult specimen, from Station XVI, also with no spicules, does not show any sucker development, but does show the same extreme contraction and apparent reduction of the tentacles in some of the polyps, while in others they are quite well developed up to about 1·5 mm. The polyps, which are not abnormally expanded, are about 2 mm. long, but some of them are extended till they are quite transparent and up to 5 or 6 mm. long and 2 mm. broad when flattened out. Very few of the tentacles, however, show great expansion. The longest were 1·5 mm. long, with a single row of 12 pinnules on each side of the middle line. The branches are more or less circular. The colour is a purplish grey. The colony is spread out over a conglomerate mass of shells, stems and debris.

Localities : Station XXIII. Dredge.
Station XVI. Dredge.
Low Isles, September–October, 1928.
Previously described from Great Barrier Reef.

Genus *Microspicularia*, n. gen.

In 1931 Sir J. A. Thomson and I emphasized the advisability of separating off from the genus *Alcyonium* those *Alcyonium*-like forms (*e. g. A. sphaerophora*) which have a very distinctive spiculation (numerous very small double-clubs or dumb-bells, together with very typical minute hour-glass-like or finger-biscuit-like forms), and a form of growth with very flat shallow basal trunk bearing numerous relatively simple and compacted lobes. Unfortunately we made a mistake in trying to refer these to the old genus *Lobularia*, which I now see is a synonym of *Alcyonium*. (The original *Lobularia* species was *L. digitata*, which of course is an *Alcyonium*.) The genus *Lobularia* must go, but there is still the necessity to separate off certain species mistakenly and persistently referred to *Alcyonium*, and I refer the species concerned to the new genus *Microspicularia*, so named from the minute size of the spicules, especially in the polyps. In addition to the features

already mentioned, another distinctive feature which has been ignored by those workers who strung the two genera together in one is the fact that in true *Alcyonium* spp., *e. g. A. digitatum*, *A. palmatum*, *A. etheridgei*, *A. brionense*, etc., the armature of the retractile polyps consists of long, narrow spindles arranged in 8 points beneath the tentacles. The armature is always in this form if present at all. This type of armature is also found in *Metalcyonium* species. Now in the *Microspicularia* species (to be enumerated later), polyp armature consists of a dense, irregularly set mass of extremely minute finger-biscuit-like forms or derivatives of these with absolutely no chevron arrangement, and completely covering the whole anthocodia and tentacles of the polyp. I cannot see that this, in conjunction with the consistently shallow, much-lobed form of growth and the typical minuteness of the dumb-bell spicules, together with the presence of biscuit-like forms, is not sufficient evidence to warrant the validity of the genus *Microspicularia*. I follow the late Sir J. A. Thomson in thinking that from a genus as cumbrous as *Alcyonium* and with such varied types as are grouped together by Lüttschwager in his Revision of the genus *Alcyonium* (1915 and 1926), also by Roxas (1933), the separating off of a distinct group of species would be, in addition, of very great help to the systematist.

The genus *Microspicularia*, then, would include the following six species : *M. sphacrophora* (Ehrb.), *M. globuliferum* (Klz.), *M. digitulatum* (Klz.), *M. pachyclados* (Klz.), *M. brachyclados* (Ehrb.), and *M. globuliferoides* (Thomson and Dean).

Alcyonium ceylonicum, Pratt, is a true *Alcyonium* and not a *Microspicularia* (see Thomson and Dean, 1931). Though the spicules resemble the double clubs of a *Microspicularia* more than any other species of *Alcyonium*, they are considerably larger and heavier than in the *Microspicularias*, and, more important, there are none of the small hour-glass-like spicules. Lüttschwager considers this species a synonym of May's *Alcyonium ceylonense*. I have had the opportunity of examining a specimen from Galle, Ceylon, which agrees very closely with Miss Pratt's original description of this Ceylon species, and another superficially very similar specimen from the same locality, with siphonozooids extremely minute and difficult to detect, which is a species of *Lobophytum*, and which I think may be a specimen of May's *Alcyonium ceylonense* as the spiculation and growth seem identical. Even if May's species is a true *Alcyonium* and not a *Lobophytum*, as I suspect, I do not agree with Lüttschwager that *A. ceylonicum* is synonymous with *A. ceylonense*, as the spiculation does not agree—there are none of the clubs described by May, and the tuberculate dumb-bells are about half the size of those in *A. ceylonense*.

A summary of the features of the genus *Microspicularia* is as follows :

Alcyoniid of stout type of growth, with a very short broad, rather encrusting base and a disc densely set with very numerous small thick, compacted lobes. Spiculation exclusively of very small dumb-bell or double-club spicules and minute hour-glass or finger-biscuit-like forms. Polyp armature consists of a dense, irregularly-set mass of the minute hour-glass spicules. Genotype, *Alcyonium pachyclados*, Klunz.

Microspicularia pachyclados (Klunz.). (Plate III, fig. 2.)

Klunzinger, Korallthiere des Rothen Meeres, 1877, pt. 1, p. 24, 1 fig. ; Thomson and Dean, Alcyonacea of the Siboga Exped., Monogr. XIII*d*, 1931, p. 40 ; Lüttschwager, Arch. Naturgesch. Berlin, LXXX, Abt. A, Heft 10, p. 20.

This well-known species is represented in the collection from the Great Barrier Reef by several fine specimens.

A grey-white colony from Maer Island, with most of the polyps contracted, a few semi-expanded, has diameters of 10·6 × 9 cm. and a maximum height of 6·5 cm., the average height of the basal stock being 2·5 cm. The blunt finger-like lobes are not compressed to such an extent as in a species such as *M. sphaerophora*.

Other smaller specimens from Low Isles have well-expanded polyps. The largest of these colonies has diameters of 6·5 and 4 cm., and a maximum height of 3·8 cm.

The spiculation agrees fully with Klunzinger's description. The maximum size of the large spinose double-spheres measured is 0·1 mm. (Klunzinger quoted 0·096 as the maximum in his specimen, and Thomson and Dean 0·08 mm. in one specimen to 0·1 in another.)

A small specimen (Low Isles), with a height of 1·7 cm. and maximum diameters of 2·7 cm. and 3·4 cm., and another, a very similar one (Detailed Survey 1), with a height of 2·3 cm. and diameters of 4·6 cm. and 3 cm., are more grey in colour with brownish tentacles, the texture is rather harder and the lobes are divided up into rather smaller lobes than in the more typical specimens. The spiculation is identical, however, and I could detect no difference in the structure of the tentacles.

Another small colony (General Survey, 20th May, 1929) with a height of 2 cm. and diameters of 4·5 cm. and 2·7 cm. is white, with the fully retracted polyps showing as dark spots on the surface. In this, too, the lobes are somewhat harder and smaller than is common in the species. There do not seem to be sufficient grounds, however, for making this a new species. The shape and size of the dumb-bell spicules are identical with those of *M. pachyclados*. The only difference in the spiculation is in the tentacles, which are very sparsely dotted with a few of the minute finger-biscuit or hour-glass forms instead of being densely covered with them. It is this lack of the dusting of refractive spicules in the polyps which gives the dark-spotted look to the colony. The uneven distribution of those small spicules present on the tentacles, however, leads me to think that there has been some acid or other interference with them—some of the polyps show a complete absence of them, others show one or two at the tip of each pinnule, and others show one or two pinnules quite thickly covered with them.

Localities: General Survey of Low Isles.

Detailed Survey I of Low Isles.

Only localities stated: Maer Island, North-West Reef Flat; but Prof. Stephenson notes that this species was common in the anchorage and on the seaward slopes at Low Isles, and easily recognized.

Very wide previous record from Red Sea, Dutch East Indies, West Australia, etc.

Genus *Alcyonium*, Linnaeus.

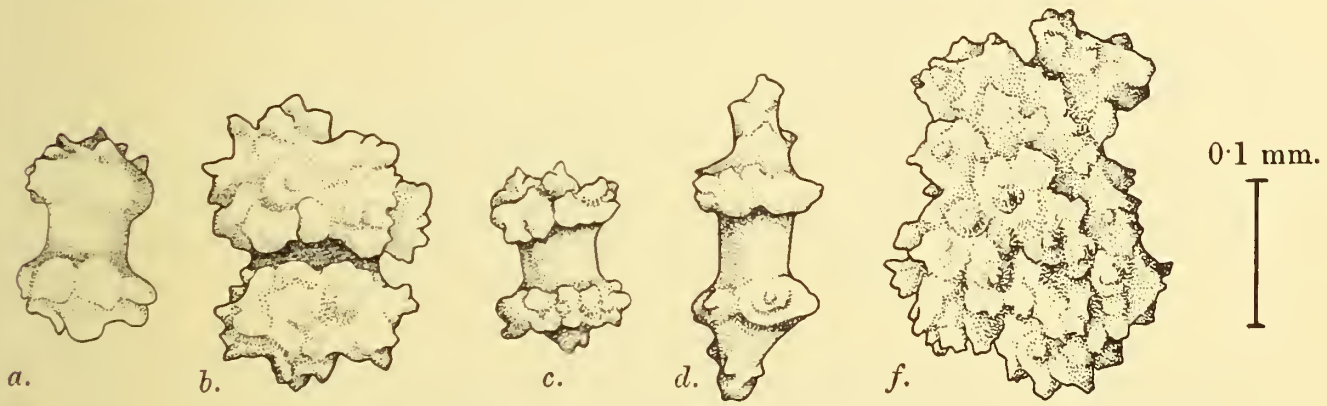
Alcyoniids whose colonies are either massive, with a stalk and a disc divided into lobes (*Eualcyonium*), or columnar and unbranched (*Metalcyonium*). The polyps are monomorphic, located on outer surface of the colony and completely retractile. The polyp-armature, if present, includes vertical or chevroned rows of spindles. The canal system is very irregular.

Alcyonium is easily distinguished from *Sinularia* by the absence of very large stem spindles and the dense outer layer of clubs found in *Sinularia*. From *Microspicularia* it is also easily distinguished by the absence of the small hour-glass-like forms typical of

Microspicularia, and by the armature of the polyp, the polyp of *Microspicularia* being a dense, irregularly-set mass of minute finger-biscuit-like forms. Dumb-bell spicules when present are always larger than the very small *Microspicularia* spicules.

Alcyonium australe, n. sp. (Plate IV, fig. 4.)

A colony from Maer Island, N.W. Reef Flat, adds a new species to the already long list in this genus. It is, however, quite distinctive, approaching nearest in spiculation to *A. ceylonicum*, Pratt, and *A. etheridgei*, Thomson and Mackinnon, but distinguished from them by a very different form of growth and by less numerous polyps than in *A. ceylonicum*, and much smaller and more closely-set polyps than in *A. etheridgei*. The colony has a broad, flat sterile stem, with an average height of 1·8 cm. At the base membranous extensions of the stem wrap round a piece of madrepore, and at one side for a short distance the stem is 2·3 cm. high. The surface of the stem is unwrinkled, slightly harsh to the



Text-fig. 1.—*Alcyonium australe*, n. sp. Spicules.

touch. Its more or less flat surface bears a much-lobed capitulum covered with polyps. Some of the lobes are small, simple, rounded at the tips, from 3 mm. to 1·5 cm. high, and from about 3 mm. to 9 mm. broad. But there are, in addition, flattened broad ridges, which divide in the upper half into secondary lobes, finger-like and rounded at the tips. One such fold has a height of 2·8 cm., a breadth of 3 cm. and a thickness of about 6 mm. It divides at the top into five finger-like lobes closely adjacent, which increase in length in order from 4 mm. on one outer side to 1·5 cm., the outer one on the other side being slightly broader and shorter (1·2 cm. long). The whole ridge has, indeed, a faint resemblance to the palm, fingers and thumb of a hand. Some other ridges are also flattened and lobed, but there are other compound lobes which are rounded and give off secondary lobes in a more irregular manner. Most of the lobes and ridges do not grow upright on the stem, but slope markedly to one side, pressing down on each other and making the whole colony flatter and more compact. This flattening is not probably typical, however, and may be due entirely to environmental factors.

The polyps are very small, on an average about 10 or 11 to a centimetre. None are fully expanded, but the very short tentacles could be seen to have no spicules, though it was impossible to determine the number or arrangement of pinnules. The apertures in the coenenchyma when the polyp is retracted can be seen quite easily by the naked eye. They have a diameter of about 0·75 mm.

The colourless spicules are very uniform. They are nearly all tuberculate dumb-bells or derivatives of these, closely resembling both in form and size those of *A. ceylonicum*. The most common type is (*a*) dumb-bells with two terminal clusters of compound warts with a quite distinct median waist. Average dimensions are 0·17 × 0·11 mm. (*b*) In some the waist portion is much shorter, merely a slit between the two tuberculate heads, so that an almost spherical type results. Young simpler forms of (*a*) and (*b*) are there in all stages. (*c*) In some instead of two terminal clusters of warts there are two definite zones of warts near the ends which actually terminate in a distinct separate cluster of warts. (*d*) More elongated forms of this type, but with the ends more pointed, so that a spindle with two zones of warts results. These are up to 0·2 × 0·1 mm. in size. (*e*) A few very warty quadriradiate derivatives of the dumb-bell type, often with two arms more developed. (*f*) A few more massive and extremely warty irregular spheres, up to 0·22 mm. in diameter. The canal walls are filled with spicules, but there is quite a definite space between individual spicules, and they are not packed as closely as in the cortex, where they lie in a dense mass. The texture of the colony is firm and hard, only slightly fleshy. The colour is a very light greenish-grey.

Locality : Maer Island. N.W. Reef Flat.

I take this opportunity of stating that Wright and Studer's (1889) two species of *Alcyonium*, *A. haddoni* and *A. sollasi*, the types of which I have examined in the British Museum, are unquestionably true species of *Alcyonium* and not of *Sinularia*, as Lüttschwager thought might be possible (' Phil. Journ. Sci.' XX, 1922, p. 538).

Genus *Sinularia*, May.

Alcyoniids where the capitulum is not a definite disc delimited from a sterile stalk. The zooids are borne on finger-like or lobe-like processes. Siphonozooids are indistinguishable on the outer surface ; if present they are completely rudimentary. In the stalk, the cortical spicules are small clubs forming a dense outer layer ; the inner spicules are very large warted spindles up to 1 cm. long, with the warts not arranged in zones as in *Lobophytum*.

Sinularia conferta (Dana), n. var. *gracilis*. (Plate II, fig. 1.)

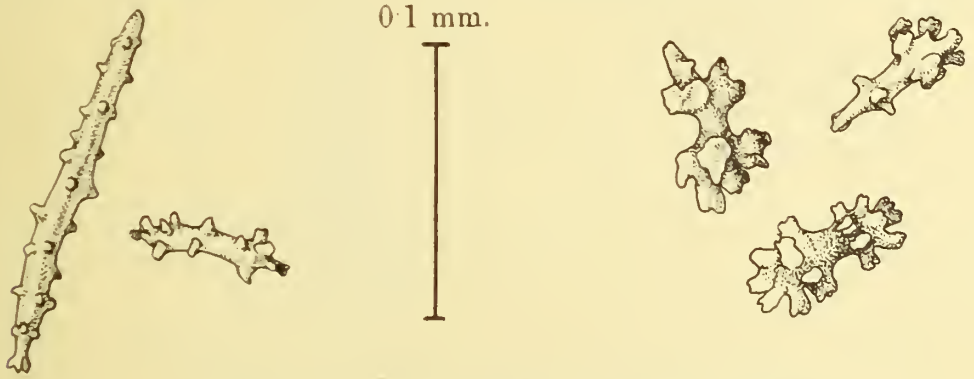
Kolonko, Die Gattung *Sinularia*, Mitt. Zool. Mus. Berlin, XII, 1926, p. 313.

With some hesitation I refer to this species a specimen from Low Isles. It is 10 cm. in height with a maximum spread of 3·5 cm. The stem, which is torn on both sides, is rather flattened (partly owing to the tears), with cross-diameters of 2·3 cm. and 1 cm. Branches arise irregularly from its surface ; in this torn specimen the first branch arises 3·4 cm. from the base, but others may have arisen lower down in its complete state. The branches may have either only secondary branches, or may divide near their base into secondary branches which give rise to small tertiary twigs. The stouter branches have a diameter up to 1 cm. before they fork ; the twigs vary in length from short lobes, 2 mm. long up to about 1 cm. long and a diameter of about 2–3 mm. One very slender branch which arises at the lowest branching level is 2·3 cm. long, with a diameter of 1–3 mm. Some of the twigs have blunt tips, but the majority narrow towards the tip.

The colour is a dark grey-brown with the contracted polyps showing up as darker specks. The polyps are, on an average, about 1 mm. apart. The surface is very slightly

gritty, much smoother than in most *Sinularia* species. the texture of the twigs and branches is like indiarubber, and that of the stem. which is densely filled with large spicules, is hard.

The spicules include (*a*) small clubs of the rind, which are very varied in shape. The heads may have a central wart with a ring of warts below this (this is the most common type), or the central wart may be forked into two, or the head may consist of a mass of small blunt warts grouped closely together. The heads are large in proportion to the length. *e. g.* a club 0·09 mm. long may have a head 0·05 mm. across. The stems of the clubs have simple prominences. The clubs vary in length from 0·06 mm. (with a head of 0·04 mm. across) up to 0·17 mm. long. The majority have a length of about 0·1 mm. The maximum breadth of head is 0·06 mm. (*b*) Straight or slightly curved spindles or



Text-fig. 2.—*Sinularia conferta* var. *gracilis*. Spicules.

rods covered with some fine blunt thorns, or almost smooth. 0·15 mm.–0·4 mm. long and 0·015 mm.–0·04 mm. in breadth. (*c*) Heavy spindles for the most part with pointed ends, some rather blunt-ended covered with compound warts or simple thorns. These are up to 2·5 mm. in length, and 0·45 mm. in breadth including the warts. These spindles are densely packed in the stem.

In some ways this variety approaches *S. flexibilis*. The smooth rubber-like texture and shape of the twigs and the length of some are comparable to a contracted specimen of that species, but the mode of branching is different and the twigs have not nearly the same power of expansion. Dr. Manton states that in the living state they were clearly different species. Dr. Stephenson's field-notes state that the species was not common.

Locality : Low Isles.

Sinularia dura (Pratt).

Pratt, Alcyonaria of the Maldives, 1903, p. 528, 4 figs. ; Kolonko, Die Gattung *Sinularia*, Mitt. Zool. Mus. Berlin, XII, 1926, p. 304 ; Thomson and Dean, Alcyonacea of the Siboga Exped., Monogr. XIII*d*, 1931, p. 50.

This species, one of the most easily distinguished of *Sinularia* species, is characterized by a very hard texture, the spicules of the stem being up to 7 mm. long and the clubs of cortex being unusually large, with a head measurement of up to 0·1 mm. across and with the characteristic shape figured by Miss Pratt. It shows curiously two modes of growth, both types having been recorded both by Miss Pratt and by Thomson and Dean. The capitulum may either be a simple cup-shape, or from the surface of the cup-shaped or flattish capitulum numerous lobes may grow. The Barrier Reef specimen is of this latter

type. The surface of the capitulum is rather cup-shaped, flatter towards one side, and from the surface arise stiff, hard branches, which give rise to secondary and tertiary branching. All the characters of texture and spiculation are thoroughly typical.

The height of the colony is 5 cm. It is broken along one side, so is triangular in shape, with a maximum spread of 7·4 cm. The longest upright branch is 1·9 cm. high. The polyps are numerous on the twigs, but very sparsely scattered towards the flat centre of the capitulum.

The colour of the colony is a dark cream.

Locality : General Survey of Low Isles, A. 5 or area between Anchorage and Mangrove Swamp.

Previously recorded from Ceylon, Red Sea, Maldives, Dutch East Indies.

Sinularia flexibilis (Q. G.).

Kolonko, Die Gattung *Sinularia*, Mitt. Zool. Mus. Berlin, XII, 1926, p. 310, 1 fig. ; Thomson and Dean, Alcyonacea of the Siboga Exped., Monogr. XIII*d*, 1931, p. 53, 2 figs.

Two specimens of this distinctive and easily recognized species from Three Isles and Low Isles show its unusually long thin flexible branches (covered with polyps) which grow from the upper surface of the stout sterile stalk. The spiculation of the branches is very weak, consisting of only a few scattered small clubs, but the stem is densely packed with the heavy spindles common to *Sinularia* stems and with the rind filled with a dense mass of clubs. The stem spindles are small compared with some species of *Sinularia*, with a maximum length of about 2 mm. The warts covering their surface are characteristically large, with a diameter of up to 0·05 mm. The small clubs are very irregular in shape, but almost all have a very large, rounded head covered with low warts, and a very short stem.

The largest specimen from Low Isles has a height of 10·2 cm. and a maximum stem diameter of 5·4 cm. The longest unbranched twig has a length of 3·3 cm. and a basal diameter of 5 mm. The polyps are all semi-expanded, which increases the diameter of the twigs. The colour is creamy.

A second specimen from Three Isles with a height of 9·7 cm. and a stem diameter of 3 cm. is superficially different in appearance in the preserved state, as all the polyps are fully contracted and the surface of the contracted twigs is smooth and rubbery. It agrees, however, fully with all the characters of the species. The colour is a rather greenish-grey, lighter in the stem. Neither of the specimens show branches or twigs quite as long and slender as are found in the species, and round the edge of the capitulum the branches are very short and undeveloped.

Dr. Stephenson, in his field-notes, remarks : " Common. Makes large fields of waving, soft, light brown tail-like branches.".

Localities : General Survey of Low Isles, A. 4.

Three Isles, A. 2.

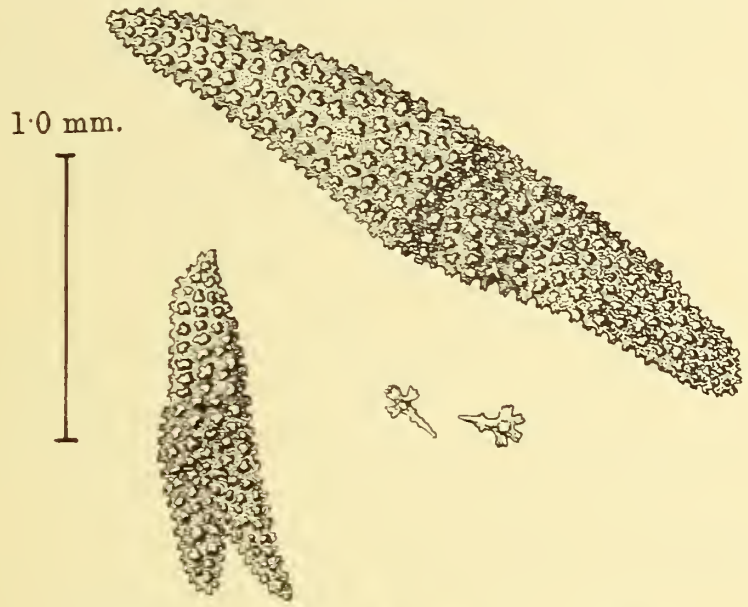
Previously recorded from Amboina, Samoa, Fiji Islands, Dutch East Indies, etc.

Sinularia gardineri, Pratt. (Plate V, fig. 2.)

Pratt, Alcyonaria of the Maldives, 1903, p. 527, 1 fig.

This species was regarded as doubtful by Lüttschwager (' Arch. Naturg.', Abt. A, Heft 10, 1914, p. 14), followed by Kolonko (' Mitt. Zool. Mus. Berlin ', XII, Heft 2, 1926,

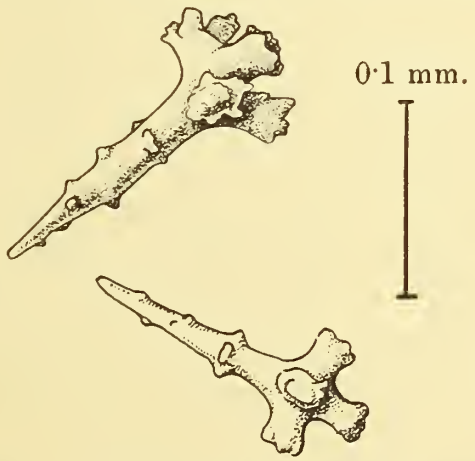
p. 333). Thanks to the courtesy of Prof. Cannon, who has sent me various specimens and types, I have been able to examine one of the Ceylon specimens identified by the author of the species. It seems to me to be unquestionably a distinct species, differing quite



Text-fig. 3.—*Sinularia gardineri*, Pratt. Spicules.

decidedly from any other described species. Two colonies from the Barrier Reef collection agree well with the Ceylon specimen both in the manner of lobing, the size and number of the zooids, and in the rather distinctive spiculation.

A flat, low-growing colony from Low Isles, with a spread of 6 × 3·4 cm. and a height



Text-fig. 4.—*Sinularia gardineri*, Pratt. Cortical clubs.

of 3·9 cm., has a low irregular stalk which slopes outwards to the edge of the capitulum, on whose flat surface are a large number of rather low, close-set lobes, which arise around the edge and from the centre. Each main lobe is much subdivided, so that at its tip there may be up to 6 or more very blunt-tipped secondary lobes. The average length of these is about 5 mm., and the highest lobe, including main and secondary lobes, is 1·5 cm. The

colour is creamy, and the texture is very hard and brittle. The autozooids are fully retracted and very inconspicuous; they are small and numerous, up to 1 mm. apart. No siphonozooids can be seen.

The spicules include the usual cortical clubs, and from the coenenchyma large, especially heavily warted spindles, up to 3 mm. or a fraction more in length. The cortical clubs are rather distinctive, being exceptionally heavy and coarse, though not as large as those of *S. dura*. The majority of them are short and stout, 0·15 × 0·07 mm., 0·22 × 0·09 mm., with a central compound wart at the tip of the head and four large ones projecting at right angles to these. They are of the type, but rather coarser and shorter, with a stouter shaft, of *S. polydactyla*, from which species, however, they are distinct. Some of the larger clubs especially have irregularly warted heads. The maximum length of club measured was 0·24 mm.

In a second flat colony, grey-cream in colour, also from Low Isles, the stem slopes outwards to the capitulum, which projects beyond it. The low, close-set lobes covering the capitulum are very blunt-tipped. They are rather shrivelled in this specimen, some are rounded, some rather flattened. The details of texture, zooids and spiculation are the same as in the first specimen. Some of the large spindles are bifurcate.

Locality: Low Isles.

Previously recorded from Maldives, Sudan, Red Sea.

Sinularia gyrosa (Klunz.).

Klunzinger, Korallthiere des Rothen Meeres, I, 1877, p. 27, 1 fig.; Kolonko, Die Gattung *Sinularia*, Mitt. Zool. Mus. Berlin, XII, 1926, p. 329.

Three colonies, two of which are from Maer Island, the third from Low Isles, are referable to this species. All show a low flat type of growth and a capitulum covered with polyp-covered wall-like folds, which twist and curve over the surface. The two colonies from Maer Island, both incomplete, are greenish-grey-yellow in colour, and overgrown with a sponge. They resemble each other so closely that they might be part of one colony. The larger fragment has a length of 8 cm., a breadth of 4·8 cm. and a height of 3 cm. The stem is 1·4 cm. high. Above this the edge of the capitulum projects in a definite ledge. The contours of the folds are somewhat masked by the growth of the epizoitic sponge; in the second colony they reach a height of 1·8 cm. The texture of the colony is very hard, almost stone-like. The large, densely-packed spicules of the stem are up to 4 mm. in length, rather blunt-ended rods or ovals. A few are pointed spindles. The clubs have heads with a central compound wart and frequently 2 or more lateral warts, which are fairly long and projecting. The normal length of the clubs is 0·1–0·15 mm., but they may reach a length of 0·25 mm.

The third colony, from Low Isles, is a fine specimen, very striking in its mode of growth. It shows the same flat encrusting form, but it would seem to have been cut through near the base, so that the actual edge of the capitulum is not seen. It is almost circular in shape, and in the middle is a complete hollow core, rather triangular in horizontal section, passing through the colony. The folds of the capitulum radiate outwards from this central space. The wall-like folds of the capitulum appear more sharp and clear-cut in this specimen, as there is no overgrowth of sponge. The colour is a clearer cream-colour, but the texture is also hard and stony. The spiculation is the same, save that the size

of the densely-packed inner sclerites is rather smaller, the maximum length being 2·2 cm. The maximum diameter of the colony is 13 cm., the height 5·3 cm., and the maximum diameter of the central hollow core 1·9 cm.

I do not consider that either the rather reduced size of the stem spicules or the unusual shape of the colony are likely to be of varietal value, but that they are probably more due to environmental factors.

Localities : Maer Island, N.W. Reef Flat. 11th May, 1929.

Low Isles. Boulder outside rampart, at south of island. General Survey.

Previously recorded from Red Sea and Pelew Island.

Sinularia leptoclados (Ehrb.).

Kolonko, Die Gattung *Sinularia*, Mitt. Zool. Mus. Berlin, XII, 1926, p. 305, 1 fig.

A small greenish-grey specimen stands 5·2 cm. in height and has a maximum spread of 4·3 cm. Slender rather knotted finger-like branches and branchlets up to 1·4 cm. long, with a diameter of 4 mm., arise from near the base of the stem. The texture is rather hard. The spiculation, in addition to long spindles, shows small cortical clubs of a shape typical of the species, 0·05 mm. and more in length, with a small head (as figured by Klunzinger and Burchardt ; for references see Kolonko, 1926), consisting of a number of closely opposed simple warts.

Locality : Low Isles.

Previously recorded from Ceylon, Amboina, Port Denison (West Australia), Philippines, Dutch East Indies, Red Sea.

Sinularia lochmodes, Kolonko. (Plate II, fig. 2.)

Kolonko, Die Gattung *Sinularia*, Mitt. Zool. Mus. Berlin, XII, 1926, p. 300, 3 figs.

Six colonies of this distinctive species show their surface characteristically covered with very numerous short finger-like or knob-like branches. They agree closely with Kolonko's description and figures of the types. A field-note by Prof. Stephenson states : "A finely-branched species—the branches very extensile during life. Common." The texture is hard. The largest specimen, yellow brown in colour, from Reef A, has a height of 11 cm. and a maximum breadth of 6·3 cm. The sterile stem viewed from one side is 3 cm. high and from the other side 3·5 cm. high. Above this arises a thick stock, maintaining almost the same diameter throughout, thickly covered with a mass of very short branches, the majority of which do not divide, but remain as short outgrowths from low knob-like swellings up to 6 mm. in length.

This species undoubtedly comes near to the type of *S. leptoclados* (Ehrb.), but the branching is much finer and the spiculation shows a distinct difference in the shape and size of the small clubs. None of these are as small as the minimum 0·05 mm. in *S. leptoclados*. The smallest are 0·07 mm. in length. The head though, as in *S. leptoclados* without a central wart, has fewer and more widely separated and distinct, blunt warts, and is generally much more irregular in form.

A brown colony, 7 cm. in height, shows longer fine branchlets, probably in a greater state of expansion. They are up to 11 mm. long, only sometimes 2·5 mm. in diameter. The spiculation is identical.

Of three other fairly contracted small colonies, two are cream coloured, the others grey brown.

Two colonies from Low Isles show a rather more uniformly stout branching, though a few of the low rather wart-like branches are present. The spiculation is identical, with the other specimens of this species. The larger of the two, with a height of 7·3 cm. and a spread of 6·5 cm., yellowish in colour, has twigs up to 15 mm. long, with a diameter of 5 mm. It bears a superficial resemblance to *S. polydactyla*, but there is no question that it is a more coarsely branched variety of *S. lochmodes*. The smaller dark brown colony shows a similar coarser branching, but exactly similar spiculation.

Localities : Reef A, Lizard Island.

Low Isles, Detailed Survey II, Yard 113.

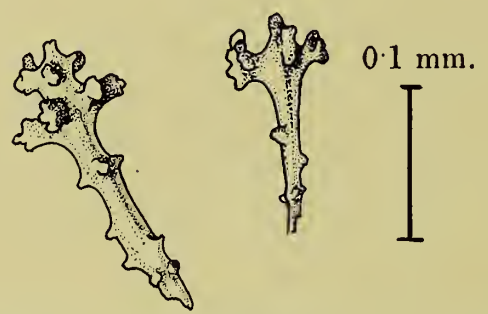
Five from Low Isles.

Previously recorded from Mindoro and Palawan.

Sinularia polydactyla (Ehrb.). (Plate I, figs. 1–3 ; Plate V, fig. 4.)

Kolonko, Die Gattung *Sinularia*, Mitt. Zool. Mus. Berlin, XII, 1926, p. 319, 2 figs.

Ten specimens show the variability in growth and to a certain extent in spiculation commonly found in this species. All the specimens are densely lobed with varying lengths of finger-like lappets, and in all the spiculation shows the very long pointed spindles, and the clubs with a head showing a central wart and a zone of lateral warts, characteristic of the species. This species has been previously described in such detail that a full description of each specimen here would seem to be unnecessary. A field-note by Prof. Stephenson states : " Common species, growing to large size, brown or grey in colour, with stout lobes."



Text-fig. 5.—*Sinularia polydactyla*. Cortical clubs.

Somewhat doubtfully I include along with these specimens two small flattened colonies from Station XXIV, which grow in one plane. The type of growth with finger-like branches and also the spiculation are within the limits of the species, but the growth in one plane is rather distinctive and the specimens are unusually hard and brittle in texture. I do not, however, feel justified in creating a new species or a new variety on such slender grounds. The larger colony has a height of 7·4 cm., a capitulum spread of 4 × 1·2, cm., and a stem 4·4 cm. high with cross diameters of 9 mm. and 2·1 cm. The stem splits into two main branches, which give rise to slender, very slightly flattened, finger-like lobes up to 1·2 cm. long with a diameter of about 3·5 mm. The autozooids (no siphonozooids can be seen) are semi-expanded, set ½ mm. to 1 mm. apart. The spicules

include warted spindles up to 5 mm. long, and cortical clubs which have, for the most part, a head with central wart, and beneath that a zone of warts projecting more or less at right angles. Some of the club-heads are simply a mass of irregularly-placed or radiatory warts. The stems of the clubs vary in length from short, stout, rather blunt-ended rods, 0·06 mm. or less in length, to long slender-pointed axes, 0·23 mm. long. The stoutness of the clubs varies very much; a club 0·2 mm. long may have a head from 0·04–0·08 mm. across and a stem from 0·02 to even 0·05 mm. across, near the head. The colour is cream, stained with brown.

The smaller colony has no striking differences. It has the same flattened, digitate type of growth, hard, brittle texture, and is creamy in colour.

Another rather doubtful specimen (Plate V, fig. 4) from Low Isles seems to me referable to *S. polydactyla*, though the mode of growth differs somewhat from the usual. The branches come off right to the base of the main stock, which also is covered with polyps to the base. Spiculation, however, and the texture and shape of the lobes are quite within the limits of this species. The club-heads of the rind have, for the most part, a central wart, with a ring of lower warts; the large-warted spindles of the stem reach a length of 3·5 mm.

The height of the colony is 7·5 cm., with maximum cross diameters of 5·9 cm. and 4·2 cm. The branches may give off short, stout, secondary and tertiary blunt twigs or lobes, or may arise from the stock unbranched and with a length of up to 1·7 cm., with a basal diameter of 6 mm. narrowing slightly to the tip.

The texture is fairly hard and firm, with a gritty surface. The colour is a greenish cream.

Localities: General Survey, Low Isles, A. 5. 11th April, 1929 (3 specimens).
Low Isles, Detailed Survey I. Outside Rampart.
,, ,, ,, II, 23rd April, 1929.
Station XXIV. Dredge (2 specimens).
Low Isles (4 specimens).
Very wide distribution (for full details see Kolonko, 1926).

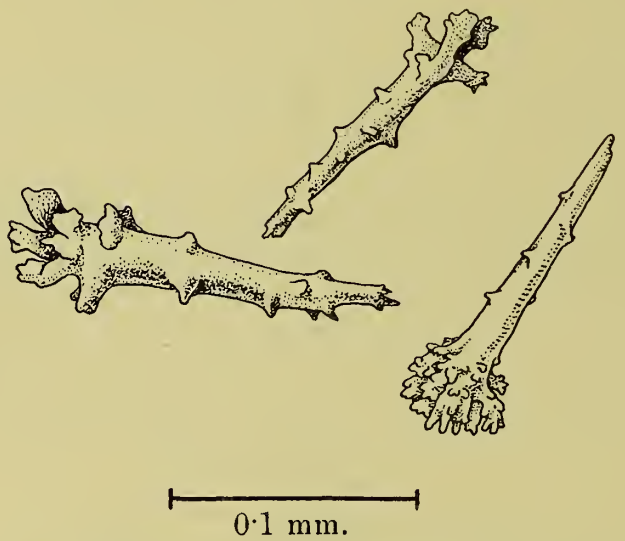
Sinularia robusta, n. sp. (Plate IV, fig. 6; Plate V, figs. 1, 3.)

Five specimens from different localities require the establishment of a new species. Its main characters are: A solid, heavy, thick-set type of growth, with a thick stem, for the most part not clearly defined from the capitulum, but merging into it in the development of polyp-bearing lobes towards the top. The lobes are thick and somewhat flattened, and grow directly upwards; they may be notched, sometimes deeply cleft to form almost circular, pointed, finger-like processes, or they may form twisting, rather wall-like upgrowths from the capitulum, not very closely folded. The texture is hard, the colour creamy to brown. The small autozooids, 0·5–1 mm. apart, are evenly and closely set, both on the lobes and centre and sides of the capitulum. There are no siphonozooids. The large warted spindles of the interior are up to 4·5 mm. in length; there are also small, much smoother spindles with few fine simple prominences. The clubs of the cortex are small, of the type with a head with generally no central wart, but composed of a large number of close-set divisions, or simply a flat head with a notched edge. There are a few club-heads with fewer, larger unevenly set warts. They vary in length from 0·07–0·2 mm.,

and across the head from 0·3–0·5 mm. In some respects this species comes nearest to *S. macropodia*, but it differs from it in many particulars.

As the type I choose a fairly small specimen (from Low Isles), which shows both separate upgrowing notched lobes and a small folded lobe of the wall-like type (Plate V, fig. 3). It has a total height of 5 cm. and cross-breadths of 5·6 cm. and 5·8 cm. It is not quite complete, as are none of the specimens. There is an encrusting thin flat base, from which arise 2 rather flattened lobes, each 2·2 cm. high and about 1·8 cm. broad, and also a thick stock 3·7 cm. high covered with polyps, with, on the top, a folded lobe 1 cm. high and one separate simple lobe of the same height. The colour in spirit is creamy; a field-note states that it was green.

Another very similar small specimen from Low Isles has a height of 5·5 cm. and cross-breadths of 5 cm. and 3·2 cm. A field-note also states that it was green.



Text-fig. 6.—*Sinularia robusta*, n. sp. Cortical clubs.

A larger specimen from Low Isles (Plate IV, fig. 6) shows the more digitate type of growth, where the flattish lobes are higher and split in their upper half, generally into two main divisions, and each of these also deeply cleft into up to 5 or 6 narrow digitate processes. The colony has a height of 7·6 cm. and cross-breadths of 5 cm. and 6·5 cm. The wall of the stalk rises in a straight line at the edge into the marginal lobes, there being no definite edge or beginning to the capitular region. It is torn at one side. There are three close-set main lobes, which divide through a median deep cleft, with, on each side of that, in a straight line, 3–7 subdivisions, into a group of stiff, upright finger-like, rather flattened processes, the apparent length of which is somewhat increased by a fold continuing down from the notch. The average diameter of one of these digits is 7 mm. and its length 1·2 cm.

A large specimen from Reef A, Lizard Island, is an example of the less digitate, more wall-like folding of the lobes (Plate V, fig. 1). Though there are a few separate stout lobes, the surface is, for the most part, covered with twisting flattened ridges, not very close set, as in *S. gyrosa*. Details of zooids and spiculation are exactly the same; a portion of a flat encrusting base is torn off. There is no direct separation from the stem

and the capitulum, the stem passing straight up into the lobes with no line of demarcation. The colony is 8·4 cm. high, with cross-breadths of 11 cm. and 6 cm.

A small colony from Yonge Reef, Outer Moat, is an even more extreme case of the possible folding of the lobes, which are more closely set than in the previous specimen.

Localities : Reef A, Lizard Island.

Outer Moat, Yonge Reef.

Three specimens from Low Isles.

Genus *Sarcophyton*, Lesson, emend. Marenzeller.

Mushroom-shaped Alcyoniids with a polyp-bearing disc folded round the margin, forming there incipient lobing, and a sterile stalk. Polyps on upper side of disc only ; retractile small, dimorphic. Cortical sclerites are small clubs and slender rods. In disc coenenchyma are longer, slender warted rods and spindles. In stalk coenenchyma are thin or very thick spindles, double spindles or cylindrical sclerites covered with large warts. There is not the zoning of the warts found in *Lobophytum*, except in *S. trocheliophorum*, where the barrel-shaped sclerites of the stalk are often zoned.

Sarcophyton digitatum, Moser.

Moser, Mitt. Zool. Mus. Berlin, IX, 1919, p. 249, 2 figs. ; Roxas, Philipp. J. Sci. L, 1933, p. 380, 1 fig.

A colony from Station XXVII agrees well with Moser's and Roxas's descriptions and figures. In this species the margin of the disc is regularly folded into high folds, which, partly owing to the slightly greater thickness of the disc than in *S. acutangulum* (Marenz.), do not develop the secondary folding seen in the latter species. The edge of the capitulum at the lobes is folded outwards. There are 6 of these simple folds, the highest arising to a height of 4·3 cm. from the level of the centre of the capitulum, with a maximum breadth of 2 cm. The tips of the two longest folds touch each other across the capitulum.

Some of the autozooids are fully expanded up to 5 mm. in length. They are 1–2 mm. apart at the edge of the disc and up to 5 mm. apart in the centre. At the margin there are 1–3 siphonozooids between two autozooids and in the middle up to about 7 or 8.

The spiculation shows short stout clubs, with a well-marked spiny head, the longest measured having a length of 0·3 mm., the maximum breadth being 0·9 mm. The coenenchyma holds very smooth slender spindles with few simple thorns. These spindles may be 0·37 × 0·015 mm. in size. In the stem are spindles (average dimensions 0·25 × 0·04 mm.) covered with simple prominences and only very occasionally with heavy compound warts.

The height of the colony is 7·8 cm., but the stem has grown 5·4 cm. horizontally before bending sharply up at right angles. If straightened out the total height of the stem would be about 10 cm. The maximum diameter of the capitulum is 6·5 cm.

Moser describes the disc of his specimen as soft ; in our specimen the texture is quite firm, though it yields to pressure of the fingers.

Locality : Station XXVII. Dredge.

Previously recorded from the Philippines.

Sarcophyton elegans, Moser.

Moser, Mitt. Zool. Mus. Berlin, IX, 1919, p. 252, 2 figs. ; *S. convolutum*, Thomson and Dean, Alcyonacea of the Siboga Exped., Monogr. XIII*d*, 1931, p. 63, 2 figs.

A small brown, rather dried-up colony from Station XIX can be referred to this species. It shows the thin margin of the disc thrown irregularly into low rounded folds, broader than high, which turn in towards the centre. The autozooids are large and very scarce in the centre of the disc, more crowded on the margin. The siphonozooids are small and very numerous. The spiculation agrees closely with Moser's description. The colony is small, typical of the species. It has a total height of 4·2 cm., and a maximum capitulum diameter of 4·4 cm. *S. convolutum* is a synonym of this species and not of *S. acutangulum* as considered by Roxas (' Philip. Journ. Sci.', vol. l, No. 4, 1933, p. 371). The folding of the disc, size and number of zooids and spiculation all agree, rather than with *S. acutangulum*, which it differs from in many particulars.

Locality : Station XIX.

Previously recorded from Philippines.

Sarcophyton glaucum (Quoy and Gaimard).

Marenzeller, Ueber die *Sarcophytum* benannten Alcyoniiden, Zool. Jahrb., I, 1886, p. 352, 3 figs. ; Burchardt, Alcyonaceen von Thursday-Island und von Amboina, Denkschr. Med.-Naturw. Ges. Jena, 1898, p. 676, 3 figs. ; Thomson and Dean, Alcyonacea of the Sigoba Exped., Monogr. XIII*d*, 1931, p. 57, 2 figs.

A dark grey colony (marked " General Survey, A. 1 ") with a height of 6·5 cm. has a capitulum (4·5 cm. in diameter) showing the soft flexible texture, the very large autozooids, some of which are expanded, and the clear siphonozooids all typical of the species. The margin is convoluted in a few large folds. Also typical is the presence in the stalk of markedly large spicules, warty spindles, which are often so large in this species that young forms are apt to be confused at first sight with a young *Sinularia*, where these large spindles are typical. The usual club-like spicules of *Sarcophyton* species are, in *S. glaucum*, long in proportion to their breadth, with a very ill-defined head.

Another young colony from Maer Island, greenish grey in colour, with the capitular margin convoluted in high, close folds, is rather finer in texture, but shows very typical spiculation.

Another dense grey small colony from Low Isles has a height of 3·3 cm. and an almost circular capitulum with a maximum diameter of 2·4 cm.

Localities : Maer Island, N.W. Reef Flat, 11th May, 1929.

Low Isles, General Survey A. 1.

Very wide distribution—Australia, Philippines, Amboina, Red Sea, etc.

Sarcophyton trocheliophorum, Marenz.

Marenzeller, Zool. Jahrb., I, 1886, p. 359, 2 figs. ; Thomson and Dean, Alcyonacea of the Siboga Exped., Monogr. XIII*d*, 1931, p. 60.

Five colonies all showing the characteristics of this species. The margin of the disc, which has a smooth rubbery surface, is convoluted into thick folds, the folds being more numerous in the largest colonies ; the siphonozooids are clear to the naked eye, but only

slightly depressed ; most characteristic, the spicules of the stalk include broad, round-ended or blunt cylinders, with 2 or more median zones and 2 terminal clusters of large compound warts. The zoning of the warts in these spicules, common in the genus *Lobophytum* but unusual in *Sarcophytum*, is a good diagnostic feature of the species. All the autozooids are contracted save in one small colony, where they are partially expanded.

The largest colony, greenish cream in colour, with the margin of the disc convoluted into about 10 main thick folds, has a maximum disc diameter of 10 cm., and a stalk 3 cm. high on one side, but only 1 cm. high on the other. There are up to 12 autozooids to a centimetre at the margin, but only about 4–9 to a centimetre in the centre of the disc.

An abnormal specimen, growing on a piece of madrepore (marked " General Survey, A. 1 "), consists of a fairly large colony with a stem 3·5 cm. high and 1·8 cm. in diameter, with a nearly circular disc, about 3·5 cm. in diameter, the margin showing the beginnings of 3 or 4 folds. Growing out from the stem, about $\frac{1}{2}$ cm. from the margin of the disc, is a small round disc, too small for any folding of the capitular margin. Apparently normal autozooids and siphonozooids cover it in the usual way. About half way down the stem of the main colony on the other side from the budded small colony another stem grows outwards and downwards, with a maximum diameter of 11 mm. and a length of 2·8 cm. This abnormal outgrowth would seem to have been attached to some adjacent support, from which it has been torn away. From the base of the main stem grows out sideways yet another small colony, with a disc 1·8 cm. in maximum diameter and a stem 1·7 cm. long and 8 mm. in maximum diameter. The colour varies from cream in the stems and subsidiary colonies to brown in the disc of the main colony.

Localities : Low Isles, Detailed Survey II.

General Survey A. 1 ; A. 4 ; A. 5.

Very wide distribution—Red Sea, Madagascar, Ceylon, W. Australia, Philippines, etc.

Genus *Lobophytum*, Marenzeller.

Massive Alcyoniids with polyp-bearing disc sharply deliminated from the stalk and thrown up into lobes or finger-like processes. The polyps, small, close-set, retractile, dimorphic, the siphonozooids showing clearly to the naked eye. The spiculation is distinctive owing to the constant zoning of small spindles ; clubs may be present, but are not numerous, as in *Sinularia* and *Sarcophyton*.

Lobophytum crassum, Marenz.

Marenzeller, Ueber die *Sarcophytum* benannten Alcyoniiden, Zool. Jahrb. I, 1886, p. 363, 4 figs.

Several colonies from various localities seem to me to be referable to this variable species. A field-note by Prof. Stephenson states, " Smooth form with radially flattened combs. Grows to a large size. Common " ; while another field-note in one of the bottles (the third specimen described here) states, " Grey with light tips tending to green, forms cockscombs when large " (see photo). The majority of the specimens show in a varying degree flattened lobes subdivided along the edge in a cockscomb-like manner, but sometimes the secondary lobes are prolonged into digitiform processes, or a digitiform lobe may arise itself direct from the capitulum.

A colony labelled " Detailed Survey II " has a height of 6·6 cm., a breadth of 8·4 cm. and

a thickness of 4 cm. The growth is very irregular, the depth of the sterile stalk varying very much on all sides. At its highest it is 2·5 cm. high and at its lowest 9 mm. The lobes are cockscomb-like, their growth is also irregular, but they are all more or less directed towards the centre. One is more deeply notched, with a rather digitiform flattened lobe 2·5 cm. long and 1·4 cm. broad. The texture is gritty, but the lobes yield to the pressure of one's fingers. The autozooids are closely set, on an average about 1 mm. apart; the siphonozooids are clear, and at the tips of the lobes there are only 1 or 2 between 2 autozooids. The colour is creamy. The spicules of the stalk are short stout rods, with a cluster of warts at each end and 2 median zones of compound warts. The majority of these are about 0·18 mm. long, but there are a few up to about 0·26 mm. which are narrow and with 4 zones of warts. The majority of the shorter spicules are very blunt-ended, but some, especially the longer ones, taper more at the ends. The spicules of the capitulum are long narrow tapering spindles, with, in most cases, the warts arranged rather irregularly over their surface, but in some with a definite zoning. They are up to 0·35 mm. long, with an average breadth of about 0·05 mm., but up to 0·7 mm. broad. Small clubs are present in the rind of both stalk and capitulum.

Several other colonies have spiculation closely the same as this, as well as features of growth. A colony from General Survey, A. 1, with a height of 8·8 cm., of which about 4·9 cm. is stalk, has a more regular type of growth in the lobes, which are more closely set and compact, making the capitulum a more solid rounded mass of lobes directed towards the middle. Texture, colour and zooids are the same.

Another similar specimen, from an unmarked locality, incomplete, with a height of 8 cm., shows a large cockscomb 6·6 cm. high and 4·3 cm. long, divided into 3 deep main notches, each of which are subdivided into 2 or 3 smaller notches. There are other smaller combs, and a digitiform single lobe, 6 cm. high, which is rather flattened and gives off a very small lobe at each side. The lobes and combs are not closely adjacent or touching each other, as in the previous specimen.

An incomplete colony, only half of which remains, from Yonge Reef, Outer Moat, is harder in texture, brown in colour, agreeing as to size and number of zooids. Round the edge of the capitulum are stout, short. simple lobes; beyond these, towards the centre, are 2 closely adjacent low folds with a wavy upper edge. The larger of these is 7 cm. long, about 2·5 cm. high and 8 mm. thick, but it is not complete in length, one side showing a broken edge. The spiculation of the base is slightly heavier than in the preceding specimens, with a greater proportion of 4-zoned stout barrels, but the spicules of the capitulum are rather shorter and stouter, up to 0·3 mm., with an average breadth of 0·07 mm. and with a maximum breadth of 0·09 mm. These tend to have the warts arranged more regularly in zones, though in many the zoning is weak. The total height of this colony is 6·6 cm., its length 4·5 cm. and its breadth 4 cm. The maximum height of the rather uneven sterile stalk is 5·8 cm. Another fragment of a colony from the same locality with similar colour, texture and spiculation shows 6 rather close-set simple lobes (up to 2·3 × 1 cm.) with the tips sloping together.

An almost circular, broken specimen (with 2 small fragments) from Low Isles has a total height of 4·9 cm., a diameter of 7 cm. and a stalk of 1·5 cm. high. It has a capitulum, well marked off from the stalk, with 5 high folds radiating rather regularly towards the centre, where they meet. The folds are 2·5 cm. high and 7 mm. thick. Autozooids and siphonozooids are as in the previous specimens. The colour is brownish,

the texture hard. The tops of the ridges are slightly wavy and with an occasional not very deep notch. The spiculation of the base is very heavy: the unusually stout barrel-like forms are up to 0·25 mm. with a breadth of up to 0·12 mm., with 2 to 4 zones of very heavy warts. The 2 median zones are rather widely separated by a well-marked central waist. The spiculation of the head is also dense, with heavy pointed spindles up to 0·35 × 0·1 mm., with zoned or unzoned warts.

Localities: Detailed Survey II of Low Isles.
General Survey of Low Isles, A. 1.
Yonge Reef, Outer Moat (2 specimens).
"Low Isles" (2 specimens).
Very wide distribution, *e. g.* British East Africa, Philippines, Mermaid Straits.

Lobophytum crebriplicatum, Marenz.

Marenzeller, Ueber die *Sarcophytum* benannten Alcyoniiden, Zool. Jahrb. I, 1886, p. 362, 1 fig.

A small colony from Low Isles, with a total height of 2·9 cm. and a capitulum measuring 3 cm. × 2 cm. with a height of 2·6 cm., is cut through the stem, only about 3 mm. of which remains. The capitulum shows seven radially-directed, closely-set folds of rather even dimensions. On these the autozooids are 1–2 mm. apart, and between these lie the clearly seen siphonozooids, about one or two between two autozooids on the tops of the lobes. In addition to the usual clubs in the rind, the spicules of the capitulum are spindles up to 0·4 mm. long and ·07 mm. broad, with scattered and irregularly arranged warts. There is little regular zoning of the warts. The spicules of the base are warted spindles also with practically no zoning of the warts. The majority of these do not exceed 0·28 mm. or 0·3 mm. with a breadth of about 0·1 mm., but a very few narrow long spindles reach a length of 0·45 mm. with a breadth of 0·06 mm. The spicules agree with Marenzeller's figures. The texture is rather hard and gritty, and the colour is cream, stained with brown. Another difficult small specimen from the same locality, which I tentatively include as possibly within the varietal limits of this species, taken at the same time as the other, shows also radially-directed lobes, but of more unequal sizes. The colony has a total height of 4 cm., of which 2 cm. is sterile stalk. There are 11 lobes, 8 of which are very undeveloped and merely stumpy simple upgrowths, only beginning to be slightly flattened in a radial direction; the other 3 are more developed, two of them simple flattened ridges; the third, as with the others directed towards the centre, with a median notch. The largest lobe has a height of 2·2 cm., a length of 2·5 cm. and a thickness of 6 mm. The size and distribution of the zooids are similar to the preceding specimens, but the spiculation shows some differences. The spindles of the capitulum are, taken as a whole, longer and more slender. They reach a length of 0·5 mm., with a breadth of 0·04 mm. The spicules of the base show much more regular zoning, more crowded warts and more symmetrical outlines. They include zoned spindles up to 0·4 mm. in length, with up to 10 close-set dense whorls of compound warts very regularly arranged, in other cases with more irregularly set warts. There are also short stout spicules with two zones of warts.

The texture of the colony is firm, but yields slightly to pressure of the fingers. The colour is a creamy grey.

Locality: Low Isles.

Previously recorded from Tonga and the Philippines.

Lobophytum gazellae, Moser.

Moser, Mitt. Zool. Mus. Berlin, IX, 1919, p. 274, 2 figs.

A small colony from Low Isles, A. 5, seems referable to this species. A rounded stalk, 3·2 cm. in maximum diameter and 2 cm. high, bears a lobed capitulum, 3·2 cm. in maximum height. The lobes, which have an average thickness of 6 mm., arise round the edge as thick stumpy digits, or grow in towards the centre as flattened plates with a wavy upper edge. The autozooids are small, about 10–12 to a centimetre ; the siphonozooids are minute, and on the tips of the lobes are 1–3 in number between two autozooids. The spicules of the capitulum include the usual small clubs and spindles, unusually stout and massive, blunt-ended, with few large, irregularly arranged warts, which project so unevenly that the spicule as a whole is very jagged and irregular in outline. In some the warts are arranged in rather ill-defined whorls. Common dimensions of these " massive " spicules are 0·28 × 0·1 mm. There are also more slender pointed spindles, up to 0·43 mm. long, with irregularly arranged finer warts. In the stem are stout barrels, with 2 to 4 zones of large warts, or with the warts irregularly arranged, and with an asymmetrical outline to the spicule. Common dimensions of these spicules are 0·22 × 0·08 mm. There are also a few slender spindles up to 0·29 mm. with small, rather widely-set warts arranged in zones. A large number of crosses varying from almost simple to very warted forms are present both in stem and capitulum.

Locality : General Survey of Low Isles A. 5.

Previously recorded from New Ireland, Philippines.

Lobophytum lighti, Moser.

Moser, Mitt. Zool. Mus. Berlin, IX, 1919, p. 289, 2 figs.

Four specimens agree very well with Moser's species from the Philippines. The largest colony bears a close resemblance in actual size and appearance to the photograph of his type, and details of spiculation, etc., agree well in all four specimens. The colour is creamy, the texture very soft, especially in the more expanded colonies. The lobes, often somewhat convex on one side and concave on the other in a kind of folding, are long and finger-like in the largest specimen ; some are simple, in others two lobes unite near the base to form a stalk. They arise round the edge of the colony, so that in the largest specimen a smooth bowl results in the middle. In the smaller specimens where the lobes are necessarily more congested this is not seen so clearly. The expanded autozooids are about 1 mm. apart on the lobes, up to 5 or 8 mm. apart in the centre of the disc ; the siphonozooids are large and clearly seen.

The spiculation, described in detail by Moser, shows no variation from his description. This is one of the species where the stalk includes numerous pointed spindle forms as well as the blunt-ended barrel types. The largest specimen from Low Isles has a height of 5·2 cm., a head diameter of 4 cm., a sterile stalk 3·7 cm. high. There are lobes all round the edge of the capitulum. These may fork into two long digit-like processes : one lobe, for instance, rather flattened, is 1·1 cm. high, and forks into one process 2·6 cm. long and a shorter one 9 mm. long. There are several unbranched lobes, varying in length from undeveloped knobs to long digits 3·1 cm. long and 1 cm. broad at the base.

Two small colonies, one marked " locality unknown. Probably Low Isles ", the other

from General Survey of Low Isles. A. 4, are very similar in size and form. They show all the same general characteristics as the previous specimen, except that as younger colonies the lobes are not so long proportionally. The taller of the two colonies has a height of 5 cm.. a stem 2·8 cm. high. and a capitular spread of 3·8 cm. The longest undivided lobe is 2·5 cm. in length. rather flattened, with a maximum breadth of 1·3 cm.

Localities : Low Isles.

General Survey of Low Isles. A. 4.

Previously recorded from the Philippines.

Lobophytum pauciflorum (Ehrbg.). (Plate III, fig. 1.)

L. candelabrum, Roule, Alcyonaires d'Amboine, Rev. Suisse Zool. XVI, 1908, p. 177, 4 figs. ; Lüttschwager, Beiträge zu einer Revision der Familie Alcyoniidae, Arch. Naturgesch., Abt. A, Heft 10, 1915, p. 32, 1 fig.

Two colonies from Low Isles agree closely with Roule's description and figures of *L. candelabrum*, which, according to Lüttschwager, is synonymous with *L. pauciflorum*, Ehrbg. Certainly it agrees well with the characters of that species, though it may be found that Roule's and the Barrier Reef forms are a distinct variety from the original Red Sea specimens.

Both colonies show the distinctive features of the species : they are broader than high ; the capitulum is marked off sharply from the low sterile stalk, which shows fine longitudinal striations ; the former is covered with a number of finger-like lobes, and rounded at the summits, which may arise singly from the capitular surface or 4 or 5 in a row from a fold or ridge in the capitulum. The polyps are less numerous than in many species of *Lobophytum*, up to 4 mm. apart on the lobes, though more crowded round the tips and more scattered still on the flat basal lappets. The siphonozooids are very clear to the naked eye and very numerous, up to 10 or 12 between two autozooids on the lobes.

The spicules of the capitular lobes include small clubs, not very numerous, and long pointed spindles, with the warts in zones or irregularly scattered. These are up to 0·4 mm. long, and have a breadth of about 0·05 mm. The spicules of the sterile stem are stout, blunt-ended, barrel-like spicules with usually 4 zones of heavy warts and with a group of warts at each end. The majority of these are about 0·2 mm. long and 0·9 mm. broad, but a few more pointed forms are up to 0·3 mm. in length and 0·07 mm. broad.

Both colonies are incomplete, cut through the middle. One has a height of 5 cm., a length of 7 cm. and a breadth of 4 cm. There are 5 main folds which give rise to the finger-like lobes. The largest of these folds is 2·9 cm. long, 4 mm. thick and 1·3 cm. high on one side, but only 5 mm. high on the other, and gives rise to 4 upright lobes, the longest of which is 2 cm., with a breadth of 7 mm. In addition to the folds are simple digitiform upgrowths from the flat capitular surface. The stalk has a height of 3·1 cm. The other incomplete colony with a height of 6·6 cm., a length of 8·3 cm. and a breadth of 5·3 cm. shows two long ridges running parallel to each other along the length of the capitulum. One ridge has a height of 2·3 cm. and gives rise to 11 lobes, the biggest 2·5 cm. in height ; the other ridge has a height of 1·3 cm. and gives rise, along its crest, to 7 nearly parallel fingers. In addition are one or two solitary upright fingers, the longest of which is 3 cm. in height and 1 cm. in diameter.

The texture of both colonies is firm and hard, and the colour is a slightly greenish dull yellow.

Locality : Low Isles.

Previously recorded from Red Sea, Amboina, New Zealand, etc.

Lobophytum pauciflorum var. *validum*, Marenz.

Marenzeller, Ueber die *Sarcophytum* benannten Alcyoniiden, Zool. Jahrb. I, 1886, p. 367, 1 fig.

A fragment of a colony from Detailed Survey II seems to me to be referable to this variety. It shows the high folds deeply notched into rounded, finger-like branches described in the type, and the details as to zooids and spiculation also agree with Marenzeller's original description. The fragment has a total height of 9·8 cm. and a stalk height of 4·8 cm. Its maximum breadth is 6·7 cm. The texture is firm and brittle, and the colour is brownish-yellow, with the autozooids standing out as very small dark specks. On the lobes the autozooids are 1–3 mm. apart, but towards the centre they are as much as 5 mm. apart. The siphonozooids are very small, but clear to the naked eye, 4–5 in 2 mm.

The capitulum gives rise to two main folds. The larger one is not complete, the tips of the larger digitiform processes into which it divides being broken off. The breadth of this flat fold is 6 cm., its thickness 1·5 cm. and its height 3·7 cm. It gives off 2 short lobes, also 1 medium-sized one and 2 that, if complete, would obviously be very large ones. The longest of these broken finger-like processes is 4·2 cm., very slightly flattened, almost circular, with a maximum diameter at the base of 1·8 mm.

Another smaller main fold gives rise to two short lobes and 2 digit-like ones.

The spicules of the capitulum, in addition to the usual small clubs of the rind, include stout, rather blunt-ended spindles up to 0·42 mm. long and up to 0·1 mm. broad, with compound warts arranged either irregularly or in more or less regular zones. The barrel-shaped spindles of the interior of the stem are very heavy, with very regularly arranged zones of warts. They are up to 0·25 mm. long and 0·13 mm. broad. The spicules of both stem and head agree closely with Marenzeller's figure.

Locality : Low Isles, Detailed Survey II.

Previously recorded from Andamans, Tonga, Funafuti.

Family Nephthyidae.

Genus *Capnella*, Gray.

Nephthyids of upright, stout growth, tree-like or bushy. Polyps grouped on lobes, incurved and without a supporting-bundle, non-retractile. Canal-walls with numerous scattered spicules. Spicules of outer covering, polyps and canal-walls foliaceous and spiny clubs. Crosses and spindles are also found in canal-walls.

Capnella fungiformis, Kükenthal.

Kükenthal, Versuch einer Revision der Alcyonarien, II, Nephthyiden, 1, Zool. Jahrb. XIX, Syst., 1903, p. 133, 4 figs.; Thomson and Mackinnon, Alcyonarians Collected on Percy Sladen Trust Exped., Trans. Linn. Soc. Zool. London, XIII, 1910, p. 179, 1 fig.; Thomson and Dean, Alcyonacea of the Siboga Exped., Monogr. XIII*d*, 1931, p. 71, 2 figs.

A small bushy colony, with one broken-off twig, from Low Isles, coral head on seaward slope of reef, has a height of 3·3 cm. and a maximum spread of 2·5 cm. The

base of the stem, which is broad and flattened, has diameters of 8 mm. and 2·6 cm. The colour in spirit is brownish, lightening to a dirty cream colour on the polyps. The incurved polyps are up to 1·5 mm. long, and form a dense covering on the lappets. The lappets are crowded and start branching from very near the base of the barren stem, which shows longitudinal striation, probably due to post-mortem shrinkage.

The type of spiculation throughout is in agreement with that of this species. The polyp armature consists of irregularly arranged, bent, thorny spindles (up to 0·45 mm.), and warty clubs which may show slight foliation at the thick end. The size of these polyp spicules is larger than in the type described by Kükenthal (the maximum length given was 0·2 mm.) and than in the specimens from the "Siboga" Expedition, and agrees more with the dimensions given by Thomson and Mackinnon (up to 0·408 mm.) for their specimen from Coetivy. In all other points the specimen agrees with the type very closely, and there does not seem sufficient reason to consider it other than a variety of the species. The spicules of the stem include the typical oval or barrel-shaped spicules and double spheres with the warts arranged in zones.

Locality: Low Isles, coral head on seaward slope of reef.

Previously recorded from Indian Ocean (Coetivy and Dar es Salaam) and Dutch East Indies.

Capnella imbricata (Q. G.).

Kükenthal, Versuch einer Revision der Alcyonarien, II, Nephthyiden, 1, Zool. Jahrb. XIX, Syst., 1903, p. 129; Thomson and Dean, Alcyonacea of the Siboga Exped., Monogr. XIII*d*, 1931, p. 71, 3 figs.

Two greenish-grey colonies from Maer Island. The larger consists of two main trunks, each about 4·5 cm. high and 3·7 cm. in diameter, united at the base, where they grow very symmetrically on a piece of madrepore. The tops of the two sterile trunks are covered with a close mass (up to 1·8 cm. high) of polyp-bearing lappets, the polyps characteristic of the genus *Capnella* overlapping each other and densely covered with an armature of foliaceous clubs. The spicules, which have been described previously in detail, include small foliaceous clubs, some short, others with elongated stem; 4-rayed stars and crosses mostly heavily warted; rough, very warted spheres, with sometimes a hint of being quadriradiate. The smaller colony has diameters of 2·5 and 4·9 cm., and a height of 6 cm., of which about 2 cm. is made up of the bare trunk.

Locality: Maer Island, North West Reef Flat.

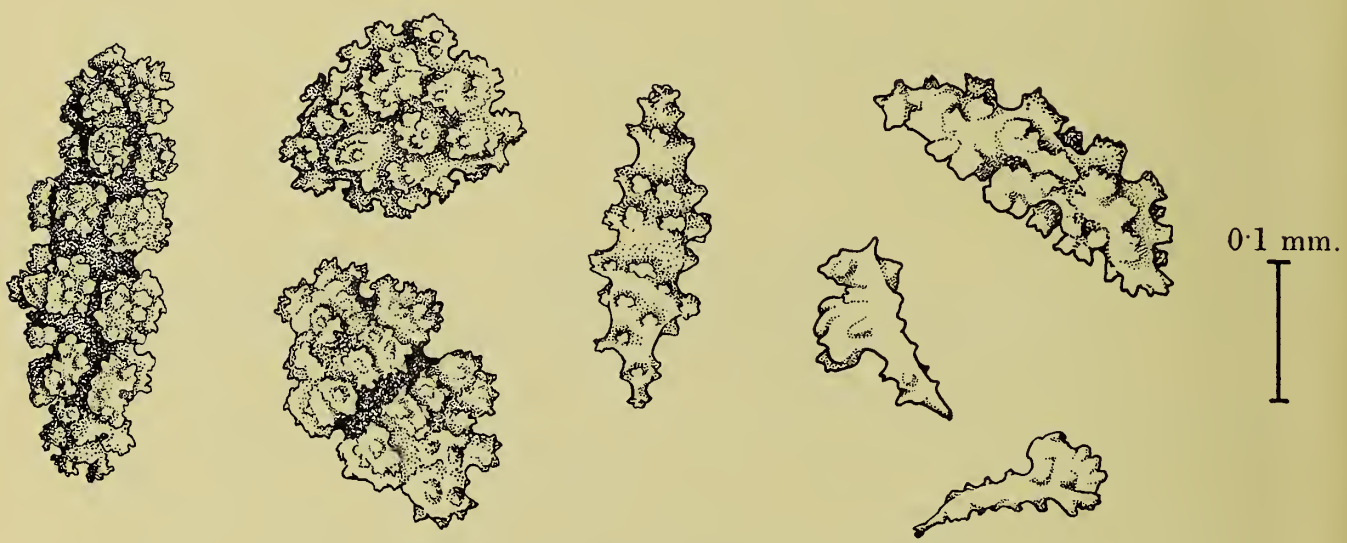
Previously recorded from New Ireland, the Philippines, Dutch East Indies.

Capnella lacertiliensis, n. sp. (Plate IV, fig. 5.)

A distinctive specimen of this genus from Coral Patch, Undine Reef, has a remarkable resemblance to a lizard skin owing to the rather green-grey coloration and the somewhat regular arrangement in rows of the small incurved and flattened polyps. As in my opinion it is certainly a new species, and as it has been given on the label the tentative description, "Lizard Skin Lobophytum", I propose as a name for it *Capnella lacertiliensis*.

The total height of the hard rigid colony is 2·6 cm.; the low broad stem is practically unwrinkled, hard and harsh to the touch, and for the most part has an average height of 5 cm., though at one side it is 1·3 cm. high. It has basal diameters of 1·9 cm. and 1·1 cm.

From the flattened upper surface of the stem arise the polyp-bearing lappets, which have an unusual shape for a *Capnella* species, and are suggestive of the type of growth in the lobes of some Lobularias, *e. g. L. pachyclados*. The majority of the lappets are slightly flattened and their sides slope to a rather sharp-edged crest or summit, which may be slightly indented in the middle or twice. Some of the larger lappets are compound, consisting of a base which splits into 3 or 4 secondary lappets closely pressed together. The maximum height of a lappet is 1·2 cm. and a maximum breadth also 1·2 cm. The maximum diameters of the polyp-covered lappet region are 3·3 cm. and 2·5 cm. The polyps are extremely small and flat, about 0·09–0·1 mm. in length and 0·06 mm. in breadth. They lie in true *Capnella* fashion closely adjacent, with the mouths pointing upwards and incurved to the surface of the lappet. But there is very little actual curvature in the base of the polyp, which, when viewed under the microscope, appears to be speckled with



Text-fig. 7.—*Capnella lacertiliensis*, n. sp. Spicules.

white. These white specks are the foliaceous heads of the small club-spicules with which the back of the polyp is armed, and which grow so that only the heads appear beyond the surface of the polyp wall, and make it roughened. The majority of the clubs have a length of about 0·14 mm., but they range from 0·09 mm. to 0·19 mm. Some are true clubs, with straight folia in line with the handle, but in others the folia project sideways at the tip of the head, and in a few from near the middle of the handle, so that they form miniatures of the triradiate type found in *C. rugosa*. The spiculation of the polyps, with its rough surface caused by the projection of folia from the polyp wall, is comparable to that in *C. rugosa*, but is very much more delicate, and the folia never approach the large dimensions found in the latter species. The largest folia are 0·05 mm. high, while in *C. rugosa* they are more than double the size.

The lappets, in addition to the actual polyp spicules, include the following types of spicule : (*a*) Stout, blunt-ended or pointed spindles covered with large compound warts, in most arranged in zones (up to 0·28 × 0·13 mm.), though in some the warts are irregularly arranged. Very common are types with 4 zones and 2 terminal clusters of warts ; (*b*) there are also more slender-pointed spindles with a few simple or slightly

compound prominences (average dimensions, 0·22 × 0·05 mm.). In the stem are types the same as (*a*), but the majority are shorter and stouter barrel-like forms, with a median waist, and two zones and terminal clusters of compound warts (average dimensions 0·2 × 0·12 mm.). There are also some almost circular forms densely covered with compound warts. The canal-walls are very densely filled with spicules, which partly account for the extreme rigidity of the stem. The colour of the stem is brown, and the lappets are a greeny-grey speckled with lighter grey polyps.

Locality : Coral Patch. Undine Reef.

Capnella rugosa (Kükenthal).

Kükenthal, Alcyonacea, Wiss. Ergebn. der Deutschen Tiefsee Exped. XIII, 1, 1906, p. 68, 4 figs.

A small brownish-grey colony from Station XXV agrees well with Kükenthal's description of this distinctive species of *Capnella*, previously recorded from the Indian Ocean, on the South African coast. A very short sterile stem gives rise, at a height of 2–3 mm., to a number of extremely short branches, which divide into polyp-bearing lappets, up to 7 mm. in length and 4 mm. in breadth. The polyps are densely crowded on these, overlapping each other.

The most striking feature of the species is the very heavy armature of the polyps. The spicules form a close covering on the polyp wall of bent or nearly straight, warted spindles, with a median or nearly terminal mass of high folia, which project from the polyp wall, giving it a very rugose appearance. The spindle with the projecting folia forms a triradiate. The largest of these spicules measured 0·42 mm. from tip to tip of the slightly bent spindle and with folia projecting 0·12 mm. from this. None of the spindles were as long as 0·65 mm.—the figures given by Kükenthal as the maximum length. We do not feel justified, however, in making a new species on this account, as the colony is a very young one, and its characters, apart from these spicule measurements, agree very closely with those of *C. rugosa*. Also present in the polyps are foliaceous clubs and warty spindles, and in the rind of the stem are irregular stellate forms and warty capstan-like forms, as figured by Kükenthal. In addition there are warty spindles and a few clubs, some with a foliaceous head.

Locality : Station XXV. Dredge.

Previously recorded from Indian Ocean, South African coast.

Genus *Lemnalia*, Gray.

Nephthyids branching like trees, long bare stem and branches giving rise to twigs on which are grouped the non-retractile polyps, which arise singly or in bundles or groups. Polyps with no supporting-bundle. Spiculation very dense, but all spicules of a delicate type. Stem cortex smooth and often semi-transparent, through which show vertical lines of canal-walls. Stems very fragile and brittle. Two typical forms of spicule are the fine-warted spindle and a crescent or bow-shaped form, with 2 basal warts. Derivatives of these types, *e. g.* crosses, are also present. The tentacular spicules are minute, finely-warted spindles or flat-sculptured scales.

Lemnalia brassica (May).

Ammothea brassica, May, Jena. Z. Naturw. XXXIII, 1899, p. 139, 1 fig.; *Lithophytum brassicum*, Kükenthal, Versuch einer Revision der Alcyonarien, II, Nephthyiden, 1, Zool. Jahrb. XIX, Syst., 1903, p. 120; *Lemnalia brassica*, Kükenthal, Alcyonaria des Roten Meeres, Denkschr. Akad. Wiss. Wien, LXXXIX, 1914, p. 15; Thomson and Dean, Alcyonacea of the Siboga Exped., Monogr. XIII*d*, 1931, p. 76.

Two colonies from Maer Island, N.W. Reef Flat, are neither quite complete, but torn off at the base of the stem. One colony, 6·8 cm. in height and with diameters of 4·5 cm. and 6·8 cm., is the more typical in its rather cauliflower-like form of growth. The sterile stem, torn and slightly flattened, is 2·6 cm. in height and with a maximum diameter of 2·3 cm. It gives rise to a branched polyp-bearing region, where the twigs are short, rounded or stumpy, flattened at the tips and closely pressed together. They are densely covered with polyps, and on an average have a height of 7 cm. and a breadth of 5 or 6 cm. One side of the colony is less densely covered with polyp-bearing twigs and the growth appears more open. The polyp size agrees more closely with the measurements given by May for *Ammothea* (*Lemnalia*) *bauiana*, which was merged by Kükenthal into *L. brassica*. They are up to about 1 mm. in height.

The spicules include finely warted, slightly bent spindles up to 0·38 mm. in length and 0·02 mm. broad. There are also smaller spindles with a few warts towards the middle, and also bow-forms with the large median basal warts so that a somewhat 4-rayed form is produced.

The second colony is larger, with a total height of 7·5 cm. and a maximum spread of 8 cm. The growth here is less typical and more open, like a cauliflower which is over-ripe and has begun to sprout. Some of the twigs have kept their short rounded shape and are closely adjacent to each other, but others are more elongated and less closely pressed together. All the other characteristics are, however, identical.

The colour in both colonies is pale cream and the stems show fine, longitudinal striations (owing to the same transparency of the stem revealing the canal walls), and have a peculiar brittleness typical of *Lemnalia* species owing to the great number of very fine spicules in the numerous canal walls.

Locality: Maer Island, N.W. Flat.

Previously recorded from Baui Island (near Zanzibar) and Savu (Dutch East Indies).

Lemnalia elegans (May).

Ammothea elegans, May, Jena. Z. Naturw. XXXIII, 1899, p. 139, 1 fig.

A colony from Station XXVII, which agrees closely with May's description and figure, shows the stout stem and primary branches, with delicate polyp-bearing twigs towards the top of the colony, characteristic of the species. Also characteristic is the spiculation with (*a*) the spindles unusually large for the genus, in our specimen up to 0·52 mm. long and 0·03 mm. broad. (May's measurements were up to 0·47 mm. long and 0·03 mm. broad.) (*b*) What May describes as "numerous double-clubs", up to 0·09 mm. long. These are like the double-capstans described in *L. digitiformis*, n. sp., but the ends are more heavily warted. Irregular, almost stellate forms are derivatives of these, and there are also a few quadriradiates and transitorial stages between the double-club and the quadriradiate.

The colour is creamy white.
Locality : Station XXVII. Dredge.
Previously recorded from Tumbatu, South Reef (East Africa).

Genus *Paralemnalia*, Kükenthal.

Genus very closely allied to *Lemnalia* and showing similar features of spiculation and brittle texture. Polyps, however, are retractile, and mode of growth somewhat different. A stout common base gives rise to a number of finger-like stems, which are unbranched or branched very simply into further finger-like processes. There is none of the fine branching into delicate twigs found in *Lemnalia*. The polyps are found all over the branches and stems, not confined to the terminal twigs and branches as in *Lemnalia*.

Paralemnalia digitiformis, n. sp. (Plate IV, figs. 1–3.)

Four colonies, two from Batt Reef, one from Escape Reef and one from Undine Reef require the establishment of a new species. Two specimens (1933.5.3, 249, 299) in the British Museum from Portuguese East Africa show the same distinctive characteristics, and should be considered as an Indian Ocean variety of the species.

The specimen from Escape Reef is in the best state of preservation and shall be regarded as the type (Plate IV, figs. 1, 2). It is 6·8 cm. in height. The colony is somewhat flattened, and has a breadth of 4·9 cm. and a thickness of 2·4 cm. The stalk, which shows faint longitudinal striations at a height of 2·3 cm., gives rise to several stout branches, which redivide into secondary and tertiary branchlets, or unbranched long digitiform lobes may arise direct from the surface of the stalk. One such, slightly flattened, has a length of 2·3 cm. and a breadth of 7 mm. and tapers to a point. There is great variability in the amount of branching in the main branches. They are frequently flattened (*e. g.* diameters of 1 cm. and 3·5 mm.) and may show 3 or 4 small lobes at the tip. Halfway down their length may be very small lobe-like twigs, but these may be absent. The tips of the twigs are in most cases blunt or rounded ; the longer more digitiform types are rather more pointed. All the surfaces of branches and branchlets are completely covered with a close mass of semi-expanded polyps, which are so adjacent that in this expanded state they practically touch each other. They are completely retractile within the coenenchyma.

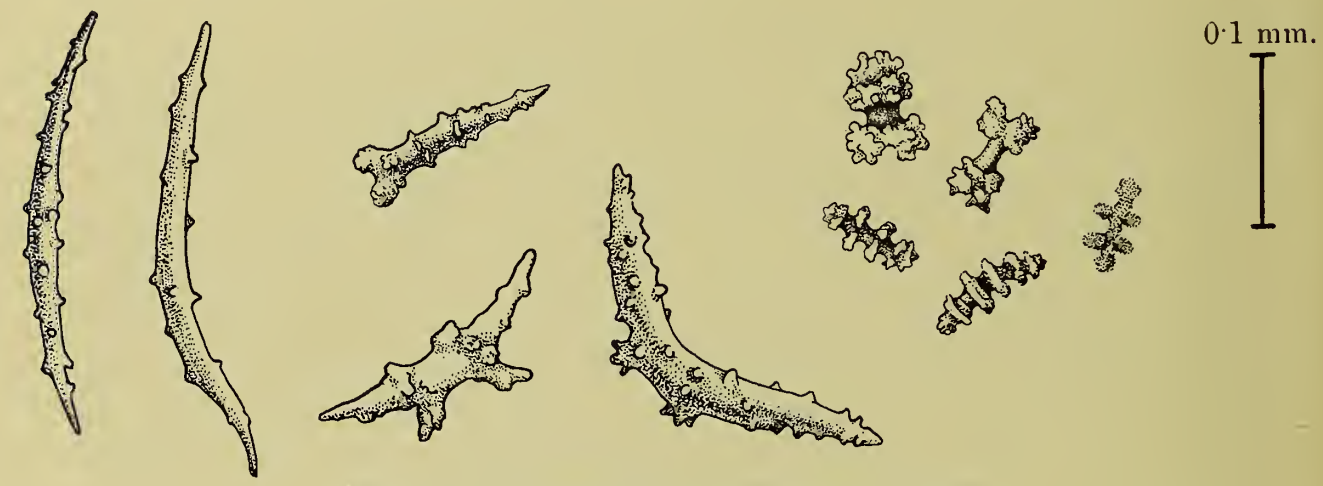
The spicules of the polyp tentacles include sculptured flattened scale-like spicules common in the tentacles of this genus. These, for the most part, have the ends finely sculptured and have two zones of sculptured warts towards the middle. An average length is 0·07 mm. These are also even smaller (about 0·06 mm.) finer spicules, sometimes arcuate and almost smooth, others with two pairs of simple prominences. The polyp wall is covered with numerous small finely-thorned spindles, sloping in vertical rows towards the mouth, but becoming horizontal towards the base of the polyp.

The most common type of spicule which fills the canal walls is the slender spindle covered with fine simple prominences. In the polyparium these are up to 0·37 mm. in length and up to 0·02 mm. in breadth. In the stem canal walls they are much stouter, up to 0·04 mm. broad, sometimes with simple or sometimes slightly compound warts. They reach a length of 0·42 mm.

In the rind of the stem are a great many very characteristic small capstan-like spicules with a median waist and two terminal heads of large warts. The average length of these is 0·06 mm. and breadth across the head 0·05 mm. They are obviously derivatives of the quadriradiates common in *Lemnalia*, but the great majority show no projecting arm or arms. There are, however, some much less numerous quadriradiates and intermediate stages between the capstan type and the latter. The quadriradiates can be described as slightly bowed spindles with two large basal warts. A common length from tip to tip of the bow is 0·18 mm.

The colour of the whole colony is a uniform dirty cream-colour.

A smaller, also flattened colony from Undine Reef (Plate IV, fig. 3) has a height of 5 cm. and breadth of 4·4 cm. and 1·3 cm. The same flattened branches lobed at the tip are present, but the branching is, on the whole, simpler, with fewer of the really short twigs arising from the larger branches. The lobes tend to swell out a little at the tips.



Text-fig. 8.—*Paralemnalia digitiformis*, n. sp. Spicules.

The longest undivided lobe has a length of 1·6 cm. Some of the polyps are semi-expanded, others are contracted. The colouring of the colony is the same as in the Escape Reef specimen.

Two colonies from Batt Reef seem at first sight rather different, but closer examination shows that any differences are probably due to preservation effects, which has caused distortion, contraction or swelling. The lobes are more definitely swollen at the top, but the same flattened branches with 3 or 4 lobes at the tip are there, and also some long undivided lobes, up to 1·5 cm. in length. The colour in both colonies is greyish, with brownish polyps. In the smaller of the two colonies, which has a height of 3 cm. and which is almost circular, with a diameter of 4 cm., the top of the polyparium is almost flat, with the tips of the very flattened lobes all at one level. Looked on from above, they all appear flattened downwards and are compressed together. This may be due to compression in fixation, or it may be an aberrant form. The longest simple lobe has a height of 13 mm. and a breadth of 9·5 mm. The spiculation of all four colonies is the same.

The most characteristic features of this species are the numerous, double-capstan-like, very small spicules from the rind, the mode of growth with its tendency to flattened branches, lobed at the tip, and the extremely numerous retractile polyps. It comes near

to *Paralemnalia flabellum* (Q. G.), but differs from it in spiculation and somewhat in mode of growth.

There is no question that *P. flabellum* (Q. G.), *P. eburnea* (Kük.), *P. digitiformis* and *P. rhabdota* (Bourne) (which, as I have seen from examination of the type-specimen, also has a digitiform type of growth and should be included in the same genus as *P. flabellum*) are species very nearly related to each other.

I have come round to the conclusion that the genus *Paralemnalia*, established by Kükenthal, though very closely related to *Lemnalia*, shows a sufficiently definite difference in habitus to be a valid genus and of definite assistance to the systematist.

I may add that I have found two unnamed specimens in the British Museum (Natural History) from Portuguese East Africa which belong to this new species. They have a very similar type of growth and identical spiculation with the characteristic abundance of double-capstan-like spicules.

Localities : Escape Reef (common inside reef crest).

Undine Reef. Coral patch.

Batt Reef. 13th September, 1928.

Paralemnalia thyrsoides (Ehrb.).

Ammothea thyrsoides, Klunzinger, Koralltiere des Rothen Meeres, 1877, p. 31, 1 fig.; *Paralemnalia thyrsoides*, Kükenthal, Alcyonaria des Roten Meeres, Denkschr. Akad. Wiss. Wien, LXXXIX, 1914, p. 16, 2nd pag.

A typical colony of this species labelled " Imitation Madrepore Alcyonarian " is greenish-cream in colour, with an average height of 5 cm., a breadth of 10 cm. and a maximum thickness the other way of 4·2 cm. It forms a solid dense block of stems, many of them characteristically dividing near the base into the branches, which, along with the branchlets, grow vertically upwards closely adjacent to each other. Also characteristic are the large polyps, with prominent, but subsessile, anthocodiae. The spicules are quite typical of the species. This species comes near to *P. flabellum* (Q. G.), but the mode of growth is more compact and typically vertical and compressed, and the polyp tentacles are not brown, as in the latter species.

Localities : Intermediate Madrepore zone.

Yonge Reef, Outer Barrier, Sub-terminal Area 1.

Previously recorded from Red Sea, Dutch East Indies.

Genus *Umbellulifera*, Thomson and Dean.

Nephthyids with long bare stem and a cauliflower-like umbellate polyparium. The polyps are never arranged in bundles within these umbels. There is no definite supporting-bundle. The polyp armature consists of 8 points in chevron, the 2 inner of these points sometimes being rudimentary or absent.

Umbellulifera planoregularis (Burchardt).

Spongodes planoregularis, Burchardt, Alcyonaceen von Thursday Island (Torresstrasse), Denkschr. med.-naturw. Ges. Jena, VIII, 1898, p. 439, 5 figs.; *Dendronephthya planoregularis*, Kükenthal, Versuch einer Revision der Alcyonarien, II, Nephthyiden, ii, 1905, p. 630; *Umbellulifera planoregularis*, Thomson and Dean, Alcyonacea of the Siboga Exped., Monogr. XIIId, 1931, p. 79.

A small cream-coloured colony dredged from Linden Bank, 28 fathoms, seems to me to be a young colony of this species. It agrees closely with Burchardt's original description.

The polyps are grouped together in umbels, not lappets, but the supporting bundle is very weak, generally consisting of simply one spindle about 1 mm. long, which does not project. The polyp wall shows 8 marked ridges of 5–6 pairs of thorned spindles in chevron. In the rind of the upper stem are warted spindles, the largest seen being 0·7 mm., and, in addition, shorter irregular spindle types (about 0·2 mm. long) with large rounded projections. In the basal rind is a dense mass of small (about 0·15 mm. across) 4-rayed spicules, very thorny.

The total height of the colony is 4·4 cm. The longitudinally wrinkled flattened stem is 3·4 cm. high, with a maximum diameter of 5 mm. At the base it gives rise to some small stolons entangled with debris, and at the top divides into three short main branches, which bear the polyp-covered twigs. The twigs are so approximated to each other that the polyps form a dense umbel-like mass. The cortex of the branches is transversely wrinkled. The colour of the stem and branches is a yellowish grey and the polyps almost white.

The reasons for establishing the genus *Umbellulifera* were described in 1931 (see Thomson and Dean, Alcyon. "Siboga" Exped.). We then suggested that *D. planoregularis* should be included in the genus, but as we had had no opportunity of actually examining the species it was a merely tentative suggestion. After having now seen this specimen, however, if my identification is correct, I have no hesitation in placing *D. planoregularis* in the genus *Umbellulifera* alongside of *U. striata* (Thomson and Henderson). It comes very near to *U. striata*, but it is quite distinct from it, with polyps having more suggestion of a supporting bundle, and a polyp armature with a lesser number of pairs of spindles in chevron.

Locality: Dredge, Linden Bank, 28 fathoms. Stations II and III.

Previously recorded Thursday Island, Torres Straits.

Genus *Nephthya*, Savigny.

Nephthyids with bushy or tree-like growth with the polyps arranged in lobes or catkins. The polyps have a supporting-bundle of spicules, which may or may not project beyond the polyp-head. The canal walls are thin.

Nephthya aurantiaca, Verrill.

Burchardt, Denkschr. med.-naturw. Ges. Jena, VIII, 1898, p. 433, 4 figs.; Kükenthal, Versuch einer Revision der Alcyonarien, II, Nephthyiden, 1, Zool. Jahrb. XIX, Syst., 1903, p. 149.

Two very small colonies from Station XII seem referable to this species. The smaller, growing on a twig, is in a better state of preservation than the larger, which is in a rather shrivelled and contracted condition. The height of the smaller colony is 1·5 cm. and its maximum spread 9 cm. It includes four finger-like, polyp-bearing lappets, the first of which arises at the extreme base of the stem. The longest lappet is 6 mm. in length. The armature of the rather large polyps consists of 8 double rows of 4 to 5 pairs of strongly thorned, bent spindles. The supporting bundle is strong, but projects only very slightly or not at all; the largest twisted spicule seen in a supporting bundle was 1·3 mm. in length. The colour of the stem and lappets is grey-white, the spicules of the supporting bundles red, or yellow shaded with red, the polyp spicules a golden yellow, or in some ploops the spicules towards the base of the points reddish. The general

appearance of the polyp head is golden yellow. The spicules of the basal stem rind are just as figured by Burchardt (Plate 32, fig. 1a).

In the larger colony, which has a height of 2·5 cm. and a maximum spread of 1·7 cm., some of the polyps have spicules which are all red, but many of them show the same colouring as in the smaller colony.

Locality : Station XII. Dredge.

Previously recorded from Torres Straits, China Sea, Shark's Bay (South-west Australia), near Cape Jaubert (North-west Australia).

Nephthya gracillima, Thomson and Dean.

Thomson and Dean, Alcyonacea of the Siboga Exped., Monogr. XIII*d*, 1931, p. 93, 2 figs.

Three specimens dredged from Station XVI agree closely with the type. They show the numerous, very delicate, long, narrow lappets, up to about 1·6 cm. long, which bear the inturned polyps. The polyps have quite a strong supporting bundle of curved, very thorny spindles ensheathing the back and not projecting. At the sides of the polyp are up to 4 pairs of thorny spindles in rather irregular chevron arrangement, and on the ventral side of the polyp is an irregular arrangement of smaller smoother spindles. Some of these are also found lying between the chevroned spindles. The bulk of the cortical spicules are spindles, varying very greatly in size, covered with warts, sometimes jagged spine-like projections more marked on one side. A small proportion of rather irregular forms occur in the lower cortex. They are like truncated spindles with long, projecting processes. On re-examination of the type I find some of these irregular forms occur in the original specimen.

In the largest of the specimens from Station XVI the total height is 8·4 cm., of which 3 cm. consists of sterile trunk. Above this 5 branches are given off which give rise to the polyp-bearing lappets. In one of the smaller specimens the sterile stalk is much longer proportionally, 4·4 cm. in length, to a total height of 8·8 cm. In this colony the twigs are less flaccid than in the other, where they hang limply. The colour of all three is a dirty cream.

Two rather shrivelled colonies from Station XXIII show the same characteristics, but owing to the bad state of preservation are much contorted and wrinkled, and are dull brown in colour.

Localities : Stations XVI and XXIII. Dredge.

Previously recorded from Dutch East Indies.

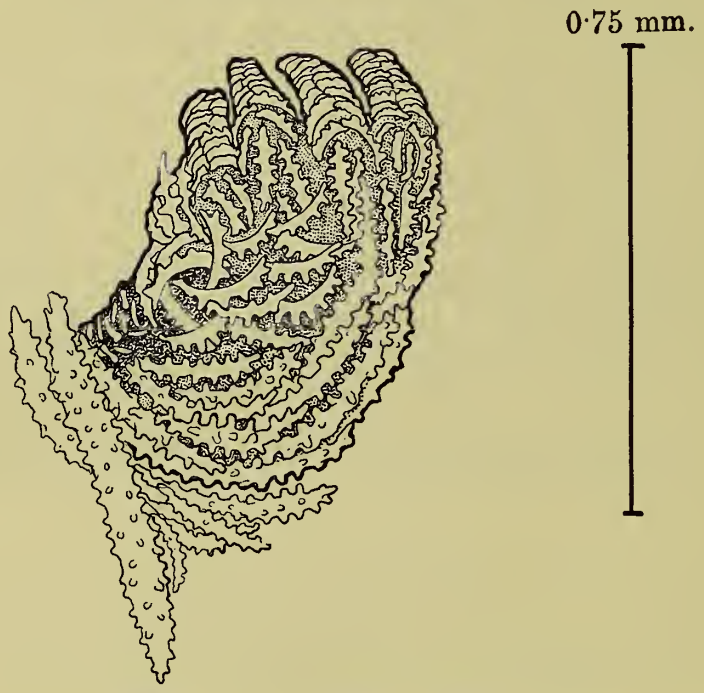
Nephthya mollis, n. sp. (Plate V, fig. 6.)

A bushy, very flaccid colony, grey-white in colour, cannot be referred to any of the existing species. From a membranous base, spreading over madrepore and stone, arise three colonies, two of which are very young, lank and with little branching, one with a total height of 5 cm., the other of 3·8 cm. The third, main stem, with a maximum basal diameter of 2·7 cm., gives off branches practically from the very base. The branching is not in one plane, and there are 6 main branches in all which give rise to the small polyp-bearing twigs or lappets of polyps. These lappets are conical in shape, with rounded summits, but vary very much in dimensions. A twig may be 12 mm. long and 5 mm.

in total breadth, and be covered with polyps arranged in small subsidiary groups of seven or so; a lappet may give off qutie a distinct subsidiary, usually polyp-covered twig about 2 mm. long near the base, or one may find distinct separate lappets only about 2–3 mm. long arising from the surface of a branch.

The branching approaches the description of that in *N. debilis* (Kük.), but from this species our specimen is separated by the armature of the polyps. Both stem and branches are very relaxed, with deep longitudinal folds in the cortex.

The polyps are small and closely packed on the twigs, and are borne at a very obtuse angle to the short polyp-stalk. The polyp head is about 0·07 mm. broad at the base of the tentacles and on the inner side about 0·4 mm. high. The armature is very dense and



Text-fig. 9.—*Nephthya mollis*. Polyp.

irregular; the only more or less regular chevron arrangement to be seen is in the supporting bundle, which is of the ensheathing type and consists of about 5 pairs of bow-shaped thorny spindles, which curve round the back of the polyp and do not project. Average dimensions of these are 0·52 × 0·05 mm. So dense and irregular is the armature round the sides of the polyp that it is difficult to discover any exact plan of arrangement in the spicules. Thorny, curved spindles, about 0·2 mm. in length, slope on each side towards the supporting bundle; beyond these are about 8 pairs of spindles, smaller and less thorny, arranged in some polyps in a very irregular chevron, while the inner side of the polyp shows a mass of small scattered rodlets, the smallest quite smooth and as small as 0·02 mm., but the majority with low roughness and with an average length of 0·07 mm. and breadth of 0·02 mm. The tentacles are armed with transversely arranged double rows of similar but more slender rodlets. A few small scattered rodlets are also seen on the inner side of the polyp stalks.

In the cortex of the twigs are thorny spindles, varying very much in size. The largest measured was 0·8 mm. In the rind a little further down a branch are numerous shorter,

blunter spindles with slightly larger blunt warts. (Average dimensions 0·2 mm. × 0·03 mm.) In the lower half of the stem the cortex becomes firmer and rougher to the touch, and is filled with a dense mass of small variously shaped spicules, with a few spindles scattered amongst them. The spindles are mostly small and with rough, fairly blunt warts. Average length 0·25 mm. Common amongst the small spicules is a double-capstan-like form, with a short median waist and two terminal zones of blunt warts. There are also somewhat stellate types, and some showing a short warty base with jagged foliar thorns above. Some small quadriradiates are also seen. An average length of all these smaller forms is 0·08–0·1 mm. Nearer the base of the stem practically no spindles at all are found, only the dense felt-work of small spicules.

Text-fig. 10.—*Nephthya mollis*, n. sp. Spicules.

The spicules of the canal walls are pointed spindles with rather few low simple warts (0·47 mm. in length); rough heavy spindles, with very large compound warts (up to 0·9 mm. × 0·2 mm.), also some large triradiates, and small irregular types with rather smooth projections (about 0·2 across). This species comes very near to *N. amboinensis*, Burchardt, in form of growth, small size of polyps, irregular spiculation of polyp and non-projecting supporting bundle, but the polyp-armature is somewhat different and the spiculation throughout shows decided differences, such as the presence of the very characteristic small capstan-like spicules, which form a dense mass in the stem cortex and which are not found at all in *N. amboinensis*.

Locality: Low Isles, Detailed Survey II.

Genus *Dendronephthya*.

Bushy or tree-like Nephthyids with the polyps arranged in groups or bundles or singly. The polyps have a supporting bundle which generally projects far, giving the colony a spiny appearance. The canal walls are thin.

Dendronephthya bicolor (Wright and Studer).

Wright and Studer, Alcyonaria, "Challenger" Report, XXXI, 1889, p. 207, 2 figs.; Kükenthal, Versuch einer Revision der Alcyonarien, II, Nephthyiden, Teil 2, Zool. Jahrb. XXI, Syst., 1905, p. 665.

Several small colonies from Station IX, all growing on two types of bivalve shell, seem to be young forms of this species, described by Wright and Studer from a specimen from Torres Straits.

Kükenthal considered it to be synonymous with Wright and Studer's *Spongodes umbellata* from the same locality, but after examining Wright and Studer's specimens, I consider that the two forms are quite distinct species. The mode of branching in *S. umbellata* is much more definitely umbellate, and the colony is much softer and less spiny, the supporting bundles of the polyps being weaker and projecting less.

The colouring is identical with the type, grey-white trunk, branches and twigs, the polyp heads in the lower part of the colony with an armature of reddish spicules, but in the upper part of the colony with white spicules. The branching in such young colonies is more open and less compacted than in the type-specimen, but slight foliation is already to be seen in the lower twigs. The polyp has a very strong supporting bundle with a main projecting spindle up to 3·5 mm. in length; the polyps are very variable, but in general their sides are more strongly armed than the inner and outer surfaces. The most common armature of the sides is 4–5 pairs of spindles in chevron, with the topmost pair stronger than the remainder and projecting beyond the tip of the polyp. But polyps were found with up to 6 pairs of spindles at the sides and also others with only 2 pairs. The small tentacular spicules may be either red or white in polyps, with reddish armature.

The height of the largest colony, growing with four other smaller colonies on a bivalve shell, is 3·3 cm., and the maximum spread of the colony is 2·3 cm. The stem has a maximum diameter of 7 mm.

Locality: Station IX. Dredge.

Previously described from Torres Straits.

Dendronephthya florida (Esper).

Esper, Pflanzenthiere, III (1788–1830), p. 49, Alcy., pl. xvi; Gray, Proc. Zool. Soc. London, 1862, p. 27, 4 figs.; Kükenthal, Versuch einer Revision der Alcyonarien, II, Nephthyiden, Teil 2, Zool. Jahrb. XXI, Syst., 1905, p. 651, 2 figs.; Alcyonaria, Kükenthal, Fauna Südwest-Australiens, III, 1910, p. 53, 1 fig.

Seven specimens along with some fragments from near Cape Kimberley are all incomplete, the much-branched polyparium present, but the stem missing. The general colouring of the branches is white with purple-red spindles. It deepens to purplish-red, due, on the twigs, to the greater numbers there of red spicules which give the colour to the colony. The spicules of the supporting bundle, the largest of which projects and may be up to 2·4 mm. in length, are also deep purplish-red, but the polyps and the polyp spicules are all dead white. The polyp armature consists of 8 points of up to 7 chevron rows of these small finely warted white spindles.

I have compared this specimen with those in the British Museum, and find that the mode of growth, which seems somewhat variable, agrees very closely with that of a colony

from the Philippines (see Gray, 1862, p. 27) and of one from Billiton Island, Philippines. The twigs in some parts of the colonies group together to form rather flat, close masses of adjacent polyp-bundles, but they may also grow in a more open type of growth, so that the individual bundles of polyps are clearly seen.

The largest of these incomplete colonies has a height of 4·4 cm. and a maximum spread of 3·5 cm.

Locality : Dredge, $\frac{1}{4}$ mile S. of Cape Kimberley, 4 fathoms (shell gravel).

Previously recorded from Hong-Kong, Philippines, South-West Australia (Shark's Bay).

Dendronephthya heterocyathus (Wright and Studer).

Wright and Studer, "Challenger" Report, XXXI, 1889, p. 210, 2 figs.; Kükenthal, Versuch einer Revision der Alcyonarien, II, Nephthyiden, Teil 2, Zool. Jahrb. XXI, Syst., 1905, p. 693.

A small colony, 2·8 cm. in height and with a maximum diameter of 2·3 cm., from Station XII agrees very closely with Wright and Studer's "Challenger" specimen. The branching, already fully described, is of exactly the same type, and the colouring and spiculation are also similar. This species is made distinctive by the polyp armature and by the presence of numerous very small rods and spindles in the polyp stems and the upper twigs. The polyp armature consists of 8 points of numerous small white or flesh-coloured or pink spindles arranged often rather irregularly in chevroned rows. There may be up to 10 or 12 pairs of these small spindles in chevron with other even smaller ones arranged irregularly between the points, and in some cases a point may consist of 4 rows of irregularly but more or less horizontally arranged spindles with little sign of a chevron arrangement. In our specimen some of these small spindles are pinker than in the "Challenger" specimens, where they are white for the most part, only a few showing flesh-colour.

Kükenthal (1905, p. 694) stated that he believed that Wright and Studer's "Challenger" species, *D. heterocyathus*, *D. monticulosa* and *D. pustulosa*, might be all of the same species. I have examined their specimens of these three species, and have no doubt that Wright and Studer were right in considering them as quite separate. *D. monticulosa* and *D. pustulosa* strongly resemble each other in growth and colouring, but the polyp armature is quite distinct. In *D. monticulosa* the spicules of the points are much larger and less numerous (not more than 4 rather regularly arranged pairs to a point), with the topmost pair much larger and projecting well beyond the polyp head. The polyp armature of *D. pustulosa*, on the other hand, is more of the same type as in *D. heterocyathus*, with numerous very irregularly arranged pairs (up to about 7–9) of small spindles in each point. These spindles are, however, decidedly stouter and longer (up to 0·2–0·3 mm. long and up to 0·05 mm. broad) than in *D. heterocyathus*, where they are markedly small (up to 0·1–0·2 mm. long and up to 0·02–0·03 mm. broad). Another difference between these two species is that the polyp spicules in *D. pustulosa* are all a chalky white, which makes the polyp heads stand out in the colony as very clearly defined small white pustules, but in *D. heterocyathus* the polyp spicules are a less dead white or flesh-coloured and the polyp head has a rather dirty white or grey-cream colour.

Locality : Station XII. Dredge.

Previously recorded from Torres Straits.

Dendronephthya nigrotincta (Ridley). (Plate V, fig. 5.)

Spongodes nigrotincta, Ridley, Alcyonaria of the Mergui Archipelago, J. Linn. Soc., Zool. XXI, 1888, p. 231, 4 figs.; Kükenthal, Versuch einer Revision der Alcyonarien, II, Teil 2, Zool. Jahrb. Syst. XXI, 1905, p. 668.

The original description of this species is not very complete, but so far as it goes it agrees fairly closely with a species of *Dendronephthya* from Station XXII. Unwilling as I am to add to the already unwieldy list of species in this genus, I shall refer our specimen tentatively to *D. nigrotincta*. The form of growth is very similar—a long stalk, with a rounded head made up of numerous small incipiently convex lobes, closely adjacent to each other. The stalk gives rise to a small number of short stout branches, which give rise, after only one or two divisions, to the terminal polyp-bearing twigs. Below the main

Text-fig. 11.—*Dendronephthya nigrotincta*. Polyp.

" head " two short polyp-bearing twigs are given off from the main stem. The stalk is much wrinkled longitudinally, and in the upper half, along with the branches, it shows marked transverse striation, noted by Ridley in his specimen. This transverse wrinkling in the stems of *Dendronephthya* is a rather unusual feature, partly dependent, as Ridley notes, on the rather rarely found transverse arrangement of the stalk spindles if they are present in numbers.

The armature of the polyp has not been described, save that Ridley mentions a projecting spindle of the zooids up to about 1 mm. in total length. Our specimen shows a polyp with a distinct, but not markedly strong, supporting bundle, with generally 2 or 3 strong, slightly twisted, thorny spindles, one of which may project for about 0·5 or 0·6 mm. The longest reached a total length of 1·3 mm. On the walls of the polyp are 8 very distinct points with marked grooves between (this agrees with Ridley's small-scale illustration). The wall of the polyp on the ventral side shows a good armature of thorny spindles in chevron (up to 5 pairs), though not quite so strong as on the dorsal

and lateral walls (up to 8 or 9 pairs). The polyp is borne at almost a right angle to the stalk.

In the branches the spicules of the cortex are delicate, twisted, thorny spindles.

In the cortex of the lower stem the spicules agree with Ridley's description in being very much branched types, some almost stellate, others more elongated. An average diameter is 0·13 mm.

The total height of the colony is 10 cm. ; the stem below the main branching into the polyparium is about 8 cm. in length, and has a maximum diameter of 1·3 cm. It gives off several stolons entangled with debris at the base. The convex polyparium is almost circular in outline, with a diameter of about 2·7 cm. The colour in spirit is dark reddish-brown, while all the spicules are colourless. This species in its mode of growth, its marked wrinkling of the stalk, its polyps with a weak supporting bundle and 8 such definite grooves between the points and the type of spiculation throughout the stem and branches approaches near to the genus *Umbellulifera*. The supporting bundle is sufficiently marked, however, to determine its inclusion into the genus *Dendronephthya*, but it must be certainly considered as a type illustrating a linkage between the two genera.

Locality : Station XXII. Dredge.

Previously recorded from Mergui Archipelago.

Dendronephthya spinifera, Holm.

Holm, Beiträge zur Kenntniss der Alcyon. *Spongodes* Lesson, Zool. Jahrb. Syst. VIII, 1894, p. 38, 3 figs.
Kükenthal, Versuch einer Revision der Alcyonarien, II, Nephthyiden, Teil 2, Zool. Jahrb. XXI, Syst., 1905, p. 567, 1 fig.

A large colony (General Survey, Low Isles, coral head on seaward slope of reef), growing in one plane, has a height of 20 cm. and a spread of 16 cm. The colouring is striking, with bundles of orange-yellow polyps on a creamy-grey background of twigs and branches, which, towards the base, are slightly tinged with ochre-yellow. Most characteristic is the very spinose appearance of the colony, due to the great development (up to 5 mm. long) of the main projecting spicule of the supporting bundle in the polyps. These large spicules are creamy-white tinted with ochre at the free tip. The polyps are grouped in bundles of up to 8, on the ends of short twigs, but towards the base of the colony the twigs are foliaceous and the polyps are arranged round the edge of flattened discs.

The armature of the polyps shows 4–6 pairs of spindles in chevron at the sides of the polyp. One of the topmost spindles in each chevron is generally considerably larger than the rest and projects beyond the top of the polyp. On the inner and outer sides of the polyp there are 2–4 pairs of chevroned spindles. The spiculation of the cortex of stem and branches is dense, with very large spindles arranged transversely across them. The largest measured had a length of 9 mm. The spicules from the cortex of the basal stem include rough warted spindles and smaller irregular forms, 3- or 4-rayed, or roughly stellate forms.

Another small fragment of a colony from the same station on the same date is exactly similar to the larger colony.

A small colony (from outer region, Batt Reef) grows in one plane to a height of 5·2 cm. and with a maximum spread of 8·7 cm. It agrees well with the other colonies,

but seems less well preserved. The branches and twigs are white except at the base of the main stem, which is very slightly tinged with yellow. The polyps are brownish except in two small patches, where they are orange-yellow.

A note from Prof. Stephenson states : " This specimen was cream, yellow and crimson during life. The species was fairly common on vertical, shaded, or overhanging surfaces below the level of low water ; we obtained it when diving."

Localities : General Survey, Low Isles, coral head on seaward slope of reef, 19th May, 1929.

Outer region Batt Reef, 27th September, 1928.

Previously recorded from Viti Island.

Genus *Stereonephthya*, Kükenthal.

Very rigid Nephthyids with the polyps arranged singly or in small groups (not definite bundles, as in *Dendronephthya*) on a stem that may be unbranched or give rise to a few main branches. The polyps have a strong supporting bundle.

Stereonephthya unicolor (Gray).

Spoggodes unicolor, Gray, Proc. Zool. Soc. London, 1862, p. 29, 2 figs. ; Kükenthal, Versuch einer Revision der Alcyonarien, II, Nephthyiden, Teil 2, Zool. Jahrb. Syst. XXI, 1905, p. 700, 2 figs.

A rather shrivelled colony from Station XXV ; has a height of 3 cm. and a maximum spread of 3·4 cm. It is bushy, with the branches in all directions, rigid and very brittle. On the twigs are borne the rather distant polyps, each with a strong supporting bundle, which projects slightly beyond the small polyp head and spreads round the sides of the polyp stalk. The armature of the polyp shows dorsally and at the sides thorny sloping spindles, as figured by Kükenthal (1905, p. 701, text-fig. J^2), while the inner side of the polyp and of the polyp-stalk show very numerous extremely small spicules scattered irregularly in the coenenchyma. The colour is a muddy grey. In the upper rind lie transversely arranged spindles up to 1·5 or 2 mm. long.

Locality : Station XXV. Dredge.

Previously recorded from Bellona Reefs.

Family Siphonogorgiidae.

Genus *Nephthyigorgia*, Kükenthal.

Very strong Siphonogorgiids with branching in one plane. Stem, branches and twigs are thick and finger-shaped. Polyps arise singly from thickly arranged, projecting verrucae in more or less transverse rows on all but base of main stem. The cortex of stem and branches thickly filled with strong warted spindles, which give a roughened surface.

Nephthyigorgia annectens (Thomson and Simpson).

Thomson and Simpson, Alcyonarians, " Investigator ", 1909, Pt. II, p. 134, 2 figs. ; Thomson and Dean, Alcyonacea of the Siboga Exped., Monogr. XIII*d*, 1931, pp. 153 and 166 ; ? *Nephthyigorgia pinnata*, Kükenthal, Alcyonaria, Fauna Südwest-Australiens, III, 1910, p. 65, 2 figs.

This distinctive species is represented in the collection by seven fine specimens. The largest, of four colonies from Station XII, shows the tendency to grow in one plane ; it

has a height of 11 cm., with a maximum spread of 11·5 cm. All show the typical stout, finger-like branches, covered closely with verrucae, and the deep red coloration of all the spicules. The general red colour of the colonies is somewhat masked in all the specimens by a coating of grey mud and debris.

Kükenthal (1910) created the genus *Nephthyigorgia* for three Australian species, one of which, *Nephthyigorgia pinnata*, seems to me undoubtedly to be synonymous with *Siphonogorgia annectens*, which should undoubtedly be referred to the newer genus on account of the distinctive mode of growth.

Localities : Station XII. Station XIX.

Previously recorded from Indian Ocean, Dutch East Indies, South-West Australia (?).

Family Fasciculariidae.

Genus *Studeriotes* (Thomson).

Colony with densely spiculose cup or involucre, into which retract numerous finger-like polyp-bearing lobes or branches. The lobes are thickly covered with polyps, which have a strong supporting bundle. Spicules all spindles except for some minute irregular forms from the canal walls.

Studeriotes semperi (Studer).

Kükenthal, Versuch einer Revision der Alcyonarien, II, Nephthyiden, Teil 2, Zool. Jahrb. Syst. XXI, 1905, p. 537, 1 fig. ; Alcyonaria, Fauna Südwest-Australiens, III, 1910, p. 69, 4 figs.

A colony dredged from Station XVI shows a branched polyparium expanded from the stiff, strongly spicular involucre, typical of this interesting family. The involucre is long, narrow and flattened, twisted to one side in the lower half and, as in a Pennatulid, terminating in a point with no flattened base of attachment, so that the colony must have stood half buried in sand or mud. Brownish traces, indeed, of a muddy deposit are to be seen on the surface, up to a height of about 5 cm., and the long curved spicules of the wall of the calyx up to that height stand out jaggedly from the surface, giving the roughened appearance common in spiculose Alcyonarian stems which have been growing in sand or mud.

The total height of the involucre is 8·4 cm., with a maximum flattened diameter of 2·2 cm. The total height of the polyparium, which is almost entirely expanded from within it, is 4·3 cm. The branches are up to 1·5 cm. in length, but their length must vary considerably according to the state of contraction or otherwise. The average breadth of a branch is about 4 mm. The polyps are arranged thickly on the branches and curve inwards on a short stalk ; they show a strong supporting bundle, of which 1 or 2 spindles may project slightly ; on the side of the polyps are up to 3 pairs of spindles in chevron, with 1 or 2 horizontal spindles beneath, rather irregularly placed, and on the inner side of the polyp the armature is weaker.

The twisted spindles on the wall of the involucre reach a length of 10 mm., as in one of Kükenthal's specimens (1905, p. 540).

The colour of the involucre and branches of the polyparium is stone-coloured and the polyps are a dark brown.

The shape of the involucre is more typical of *S. spinosa* than *S. semperi*, but the armature of the polyp and the supporting bundle (both more important features, I consider, from a systematic point of view) agree well with those of *S. semperi*.

Locality : Station XVI. Dredge.

Previously recorded from Philippines, China, Formosa.

Order TELESTACEA.

Genus *Telesto*, Lamouroux.

From a network of basal stolons arise long axial polyps, from the walls of which grow lateral secondary polyps and from these tertiary polyps, and so on up to 5, till a shrub-like or tree-like growth results. The soft distal polyp-bodies are retractile within the hard-walled calices, which form the stem and branches of the colony. There is a definite development of horny substance within the polyp walls. There is no fleshy development in *Telesto* ; the stem and branches are hard, narrow and stick-like. The spicules are rods with characteristic antler-like projections or warts ; the spicules tend to fuse in the polyp-walls.

Telesto arborea, Wright and Studer.

Wright and Studer, Alcyonaria, "Challenger" Report, XXXI, 1889, p. 262, 2 figs. ; Laackmann, Zur Kenntnis der Alcyonarien Gattung *Telesto*, Zool. Jahrb. 1908, Suppl. XI, p. 68, 2 figs. ; Thomson and Dean, Alcyonacea of the Siboga Exped., Monogr. XIII*d*, 1931, p. 212, 2 figs.

Several colonies from two stations show the characteristic thin-walled, deeply furrowed, upright stems of the species, with typical spiculation. They are all, however, young specimens, some unbranched, others slightly branched. One very young colony from $\frac{1}{4}$ mile south of Cape Kimberley, growing on a bivalve shell along with a colonial Tunicate, shows single polyps, from 0·5–2 mm. in height, connected with each other by flat stolons 1–2 mm. in breadth. One polyp 9 mm. high with grooving distinct near the tip shows 5 secondary buds, developed on four sides. Another young colony from the same locality has grown on the broken stem of a specimen of *Echinogorgia*.

Localities : Quarter of a mile south of Cape Kimberley, 4 fathoms, shell gravel. Dredge.

Station XII. Dredge.

Previously recorded from Arafura Sea, Zanzibar, Amboina, Dutch East Indies, Sydney.

Telesto rubra, Hickson.

Hickson, Alcyonaria of the Maldives, 1903, p. 480, 6 figs. ; Thomson and Dean, Alcyonacea of the Siboga Exped., Monogr. XIII*d*, 1931, p. 214, 8 figs.

A very young colony from Station IX growing on a stone shows several axial polyps united together by their stolons, which are up to 1 mm. in breadth. The axial polyps vary from very young stages under 1 mm. high, to polyps 1·5 cm. high with 3 or 4 secondary polyps. All show slight longitudinal furrows, more marked near the mouth.

The colour is pinkish red, as are the spicules, compactly fused warty spindles. As in very young specimens from the "Siboga" Expedition, the fusion of the spicules is already strongly marked. There is a possibility of young stages of *T. rubra* being regarded as *T. rigida*, Wr. and Studer, also reddish in colour. We have examined the type-specimen of *T. rigida*, however, and the absence of longitudinal furrows and a difference in the spiculation make it quite distinct.

Fragments of a fully developed colony from Station XII are typical of the species.

Localities : Station IX. Dredge.

Station XII. Dredge.

Previously recorded from Maldives, Rutland Islands, Andamans, Ceylon, Dutch East Indies.

Order GORGONACEA.

Sub-order SCLERAXONIA.

Family Briareidae.

Genus *Solenopodium*, Kükenthal.

Briareid colony flat and encrusting, sometimes with simply branched stem-like upgrowths, which are hollow save at the tips, where they may have a solid axis. Both base and stems show a softer outer layer and hard inner layer of densely packed spicules (warted zoned spindles, triradiates and irregular forms), and a horny substance is present in this "Markschicht". The small polyps are found on the outer surface of the base and stems ; they are almost spiculeless. The spicules and the general appearance of the outer layer are colourless, of the inner layer purplish-red.

Solenopodium stechei (Kükenthal).

Kükenthal, Gorgonaria, Deutsch. Tiefsee-Exped. XIII, 1919, p. 38, 9 figs.

A small piece of an encrusting species, about 6 cm. long and 4 cm. broad, seems to me to agree well with Kükenthal's description of *Solenopodium stechei*. This species develops hollow upgrowths from encrusting basal masses, and early stages of such growths are found in four low humps, one of which, cut through, shows a hollow centre. The base of the encrusting membrane, also continued into the inner surface of the hollow upgrowths, is deep purple red, while the upper rind and the polyps are whitish yellow. The depth of the encrusting membrane is 3 mm. altogether, often less. The white upper part is about 2·3 mm. thick. Some of the 8-rayed flat inconspicuous little polyp-calices are tinged with purple-red. The polyps in this specimen are about 1 mm. apart, and more closely crowded than in Kükenthal's, where they were 2–3 mm. apart. This, however, is a very variable character, if one considers colonies of *Briareum asbestinum*, young encrusting stages of which our specimen closely resembles. In that species the polyps may be nearly touching each other or 3 mm. apart.

The spiculation agrees very closely with Kükenthal's description and figures. In

the polyp are small rather rod-like spicules, with a few warts. They are grouped in our specimen near the base of the polyp and are about 0·1 mm. long. In the calix lie longitudinally arranged spindles, larger and coarser than the polyp spicules, up to 0·4 mm. in length. In the rind are large spindles, up to 0·6 mm., blunt-ended or pointed, with warts arranged in zones. There are also triradiates and irregularly branched spindles. In the outermost layer of the rind are smaller warty spindles, 0·15–0·2 mm. long. The spicules of the basal "Markschicht" are all purple-red in colour and the spicules are mostly more slender jagged and branched. They are bound quite firmly together with a distinct horny substance.

The systematic position of this genus has already been discussed.

Locality : General Survey of Low Isles.

Previously recorded from Banda (Mollucas).

Genus *Iciligorgia*, Duchassaing.

"Central spicular axis dense, imperforate. Longitudinal canals forming a circumaxial zone. Erect, branched ; stem and branches antero-laterally compressed, with knife-like lateral edges. Zooids wholly retractile, arranged in a single series along each edge of the branches ; no external verrucae" (Ridley, 1884, p. 351).

The species and true definition of this genus are doubtful, as the original description is very incomplete. Kükenthal creates a new genus for *I. orientalis*, but I am not convinced as to the validity of this, and in the meantime retain *I. orientalis* in the genus to which Ridley assigned it.

Iciligorgia orientalis, Ridley.

Ridley, Zoological Collections of the "Alert", 1884, p. 351, 3 figs. ; Thomson and Dean, Alcyonacea of the Siboga Exped., Monogr. XIII*d*, 1931, p. 190 ; Broch, Svenska Akad. Handl. LII, 1916, 11, p. 22, 5 figs. ; Kükenthal, Das Thierreich, 1924, p. 18, 1 fig.

Two fragments, blue-grey in colour, from Station XXI are typical of the species, the knife-like edges of the branches in which the polyps lie being especially characteristic. One, 13 cm. in height and with a maximum stem diameter of 5 mm., is a broken-off terminal branch with branchlets ; the other, 18 cm. in height with a maximum stem diameter of 1·3 cm., is the lower portion of a colony, the base of which has grown over a hollow tube (probably of some worm ?). Owing to this basal overgrowth with the central hollow worm-tube, it is impossible without seriously damaging the specimen to find if there are nutrient canals present in the medulla of the stem—a point disputed by Thomson and Dean, 1931. The spicules agree entirely with the description by Ridley.

Locality : Station XXI. Dredge.

Previously recorded from Torres Straits, Dutch East Indies, North-West Australia.

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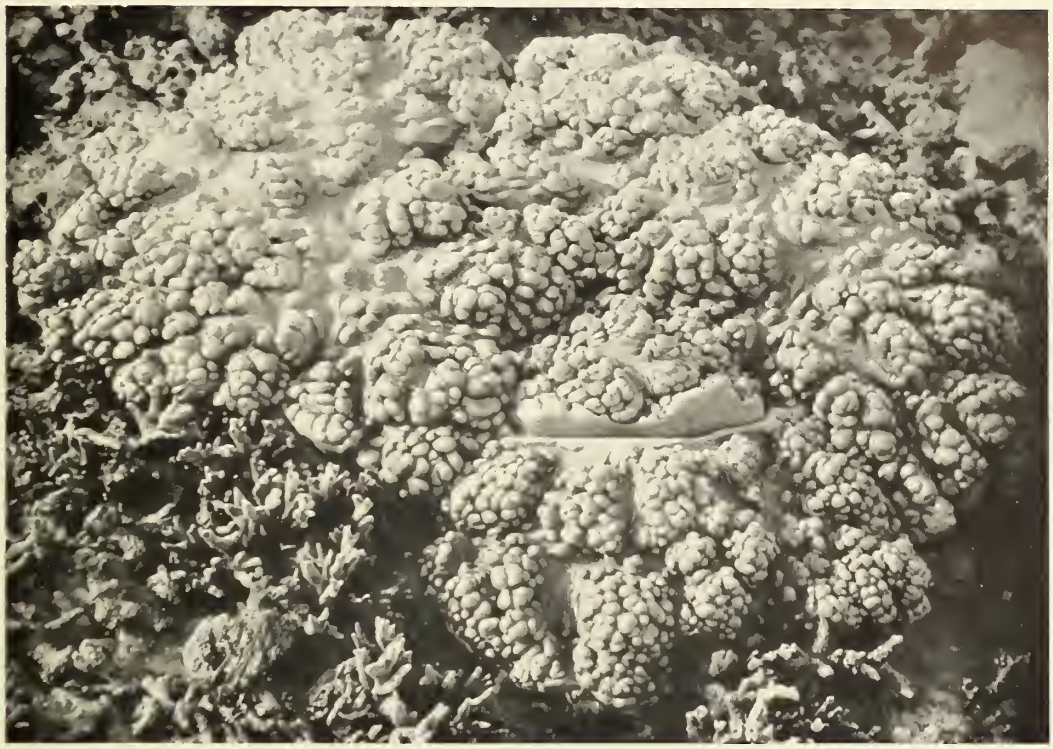
EXPLANATION OF PLATES.

(Plates I, II and III photographed by Dr. Manton from living colonies at Barrier Reef.)

DESCRIPTION OF PLATE I.

Sinularia polydactyla (Ehrb.).

Fig. 1.—Contracted in air at low tide.
Fig. 2.—Polyps contracted, branches expanded.
Fig. 3.—Above, polyps expanded ; below, polyps and branches contracted.



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DESCRIPTION OF PLATE II.

FIG. 1.—*Sinularia conferta* (Dana), n. var. *gracilis*. Polyps contracted.
FIG. 2.—*Sinularia lochmodes*, Kolonko.

1

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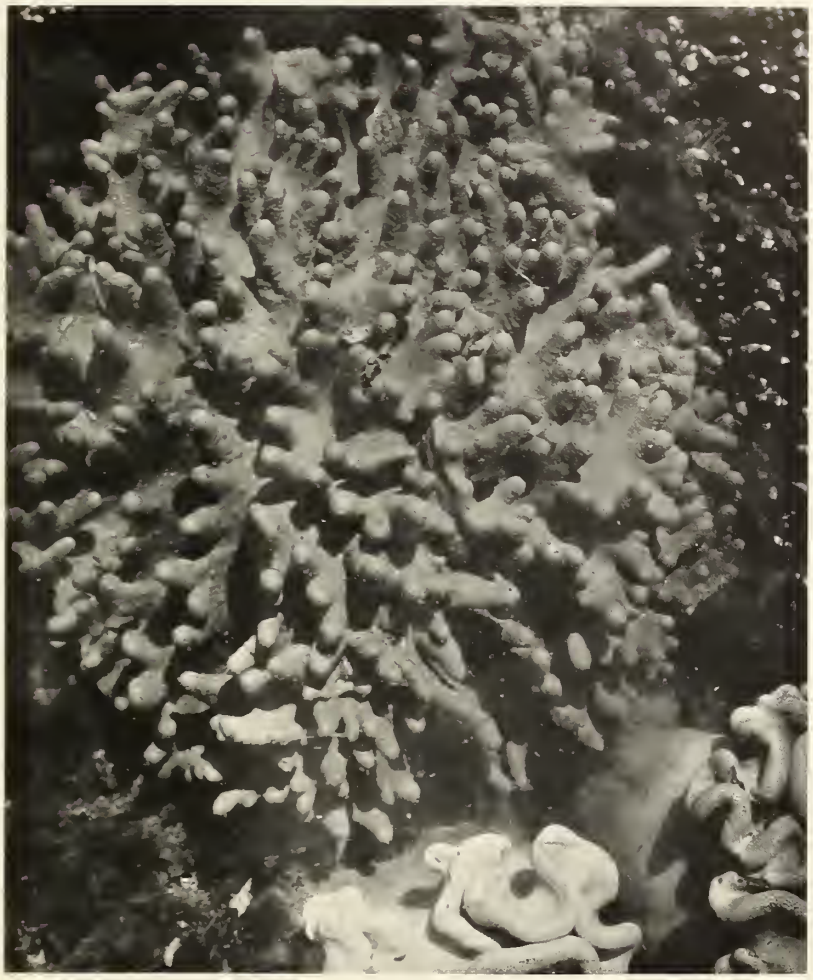
DESCRIPTION OF PLATE III.

FIG. 1.—*Lobophytum pauciflorum* (Ehrb.). Polyps contracted.
FIG. 2.—*Microspicularia pachyclados* (Klunz.). Polyps expanded (right), contracted (left).



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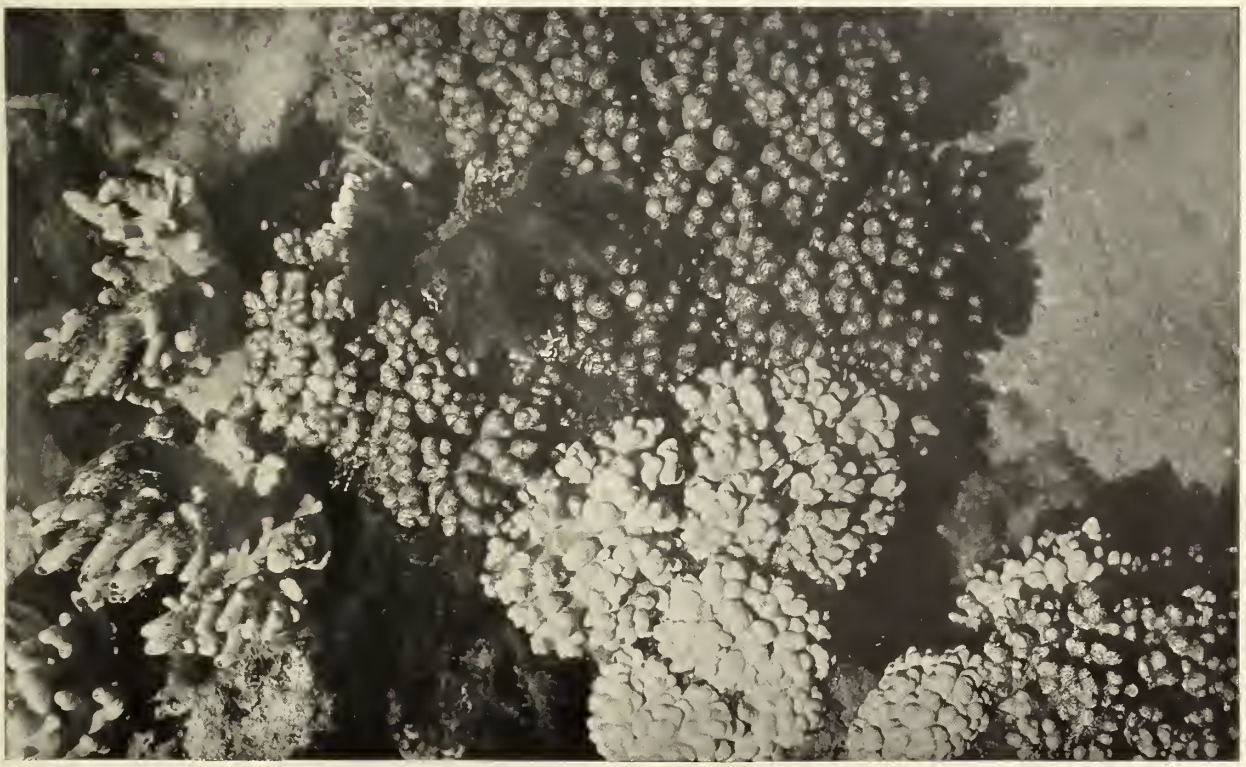

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DESCRIPTION OF PLATE IV.

FIG. 1.—*Paralemnalia digitiformis*, n. sp. Escape Reef. × 1.
FIG. 2.—*Paralemnalia digitiformis*, n. sp. Reverse side. × 1.
FIG. 3.—*Paralemnalia digitiformis*, n. sp. Undina Reef. × 1.
FIG. 4.—*Alcyonium australe*, n. sp. × 1.
FIG. 5.—*Capnella lacertiliensis*, n. sp. × 1.
FIG. 6.—*Sinularia robusta*, n. sp. × 1.
FIG. 7.—*Cespitularia erecta*, n. sp. × 1.

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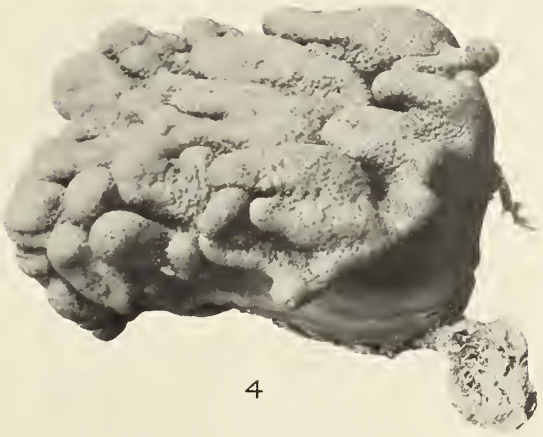

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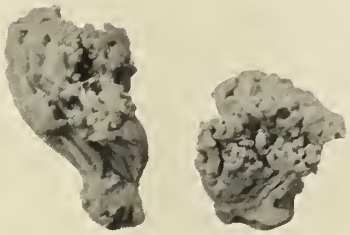

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DESCRIPTION OF PLATE V.

FIG. 1.—*Sinularia robusta*, n. sp. Lizard Island. × 1.
FIG. 2.—*Sinularia gardineri* (Pratt). × 1.
FIG. 3.—*Sinularia robusta*, n. sp. Type. × 1.
FIG. 4.—*Sinularia polydactyla* (Ehrb.). × 1.
FIG. 5.—*Dendronephthya nigrotincta* (Ridley). × 1.
FIG. 6.—*Nephthya mollis*, n. sp. × 1.

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